The Value of Fijian Coral Reefs by Nonusers: A Contingent Valuation Study to Investigate Willingness-To-Pay for Conservation, Understand Scale/Magnitude of Reef Problems and Provide Tools for Practitioners

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Carolyn E. Fonseca

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The Value of Fijian Coral Reefs by Nonusers: A Contingent Valuation Study to Investigate Willingness-To-Pay for Conservation, Understand Scale/Magnitude of Reef Problems and Provide Tools for Practitioners

Approved by:

Dr. Douglas S. Noonan, Advisor-Chair
School of Public Policy
Georgia Institute of Technology

Dr. Bryan Norton, Co-Chair
School of Public Policy
Georgia Institute of Technology

Dr. Mary F. Fox
School of Public Policy
Georgia Institute of Technology

Dr. Christopher Weible
School of Public Affairs
University of Colorado Denver

Dr. Kirk Bowman
School of International Affairs
Georgia Institute of Technology

Date Approved: July 3, 2009

Para mis padres Marco and Terry Fonseca with all my love,
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SUMMARY

A contingent valuation study was done to investigate the value of Fijian reefs by households in the Metro Atlanta area. Individuals were surveyed and asked questions about their Willingness-to-Pay for coral reef conservation, personal views on the scope/magnitude of coral reef problems, and experience around ocean related activities as well as knowledge. Results from this data, find individuals would donate on average $0.18 taking into account sample and response bias. Less conservative estimates calculate contributions per person to equal $13.9 for the conservation of Fijian reefs. These results imply Atlanta, which is very distant from Fiji, has the potential to contribute to Fijian coral reef conservation programs. Although little empirical work exists on valuation measure for reefs of non-users and groups distant to reefs, this study suggests nonprofits and developing countries could benefit from the inclusion of previously excluded (due to distance to reefs) participants. The study discusses donor characteristics as well as possible market strategies these organizations could utilize to maximize revenue. Findings from this work highlight two important issues rarely discussed in the policy literature: 1-the use of non-market valuation methods to identify stakeholders, and 2-the effects of distance on use and non-use value ultimately impacting conservation.

CHAPTER 1. Introduction

In the past, Fijians have been successful in managing the reefs, but increased poaching has increased costs of monitoring reef fishing (frequency and size of monitoring has increased). Poaching has occurred in part due to the entry of larger fleet commercial fishing, who fish larger quantities at lower costs, forcing locals to move to reef areas for subsistence fishing. As the open water fish are removed, Fijians fishing with traditional sustainable methods moved to fish in areas not sustainable to reef ecosystems. Unable to compete with larger technologically advanced competitors, local fishermen are forced to either fish in reef areas (damaging to reefs since larger herbivores are removed), change professions (decreased employment and likely income), or adopt different fishing technology (requires training and resources). Although the government and local town leaders have attempted to protect reefs via policies limiting access, poaching still occurs because the underlying incentives are not being addressed. People find the risk lower than the potential rewards, the potential for additional household income.

Fijians have decided to attempt a new strategy-using market-like tools-embedded in traditional community principles, but using a much larger support base for coral reef conservation. With the help of a non-profit/non-governmental organization (NGO), an individual can donate towards coral conservation. This program went online in fall 2008 and allows individuals around the globe to "purchase" a piece of coral. For a price, a person can buy a small coral or an area of coral reef which will be safeguarded. The non-use donors (e.g. people located far from Fiji donating for reef conservation) are not

actually buying "reef property rights" but donating towards the conservation of an environmental good. Since people are not actually purchasing the coral itself, if individuals are 'buying' anything, it is the idea that these resources will remain for future generations and purchasing the "warm-glow" feeling. The Fijian community will manage the reef and monitor for poaching using funds from the sale. However, neither the community nor the NGO have gathered information on the Willingness-to-Pay of coral by non-Fijian people (i.e. nonusers). What would people pay for Fijian coral conservation? What might be some of the obstacles and benefits of this new approach? What type of factors might influence a person's willingness to pay for coral conservation and how might these be used to increase reef value? Work from this dissertation hopes to provide useful empirical research to inform, guide or assist this Fijian program.

Coral reefs provide a variety of goods and services such as seafood products, raw materials and medicine, live fish, shoreline protection, habitat, nitrogen fixation and tourism (Cesar et al., 2002; Moberg and Folke, 1999). Reefs are highly resilient ecosystems in part because they are biodiverse with the ability to recover from natural shocks. Unfortunately, corals are under more than one type of stress (Bellwood et al., 2004). In reef systems, stress cannot always be identified until the system is severely damaged. Coral reefs around the world are under stress. Anthropogenic effects are in large part to blame for the deterioration of reefs (Bellwood, Hughes, Folke and Nyström, 2004; Bryant, Burke, McManus and Spalding, 1998; Walser, Neumann and Mannheim, 2008). As these ecosystems disappear, so does habitat for fish species, medicinal compounds to cure human diseases, and income for local communities. Fiji is home to some of the most varied, colorful, and remote coral reefs. Management of the reefs has

remained local, and long-standing traditions have provided a balanced coexistence between the reef and community. However, commercial fishing has diminished catch for locals and increased pressure to remove stock from the reefs. This in turn has led to a collapse in several of the food web links, negatively impacting reef health. Not only has subsistence fishing suffered from reef degradation but so has diving and other tourist activities dependent on corals.

UN reports suggest a 20% destruction of coral reefs with little evidence to suggest they will recover (Doyle, 2004). Coral reefs could potentially pass a critical stress threshold, particularly those suffering from bleaching. Hoegh-Guldberg argues that coral reefs will likely recover in geologic terms, but not in terms of a human lifetime and the short term impact of dying reefs will be significant.[1] Organizations such as ICRAN, IYOR, GEF, WRI, and ReefBase all have extensive data on the issues facing corals; all these suggest coral reef are under severe threats by both people and nature. Close to 50% of the coral reefs worldwide are at risk (Conservation International, 2008). Many of the solutions to decreasing the level of stress corals face lie in altering human behavior.

Pollution from logging and agriculture, a primary contributor to coral reef bleaching, is argued to be one of the most damaging factors to coral reef health. Runoff carries with it minerals and toxins that alter coral reef ecosystem composition. Other contributors to coral reef degradation are storms and recreational activities. The increase in hurricanes has negatively impacted coral reef communities. Generally, these are very resilient to storms but the intensity and frequency of them in the last 20 years has gone up drastically. This has suppressed coral reefs' natural systems, which allow them to bounce back from stress. Although recreation by divers and swimmers is argued to actually

[1] http://news.mongabay.com/2005/1117-corals.html

cause the least amount of harm, there is a perception that recreation and tourism have a negative effect on coral reefs. Initiatives exist concerning the previously mentioned issues. Policies are in place around the world to protect the reefs by reducing ocean pollution through stricter guidelines for runoff, informing the public of polluting behavior related to climate change, and divers/tourists are given much clearer instructions about how to recreate when near reefs. Even with these policies and efforts in place, coral reef health continues to decline.

Recent environmental literature and present policies do not seem to directly address the two issues – externalities and non-market value – and likely in part because these are not issues that can be easily addressed. Top-down approaches like previous command-and-control policies did not address the behavior causing the environmental damage (Bateman, Burgess, Hutchinson, and Matthews, 2008; Stavins, 2000). As reefs continue to decline questions remain as to what strategies work, since previous command and control approaches have had limited success. Because coral reefs do not have a clear price (non-market good), when decisions are made affecting reefs the total impacts are not taken fully into account. Knowing the total value of reefs, including nonuse and the value placed by nonusers could inform policy makers and possibly lead to more successful policies. Environmental policies are all embedded in explicit or implicit values. The "price" and "perception" of an environmental good mold the delineation/boundary of the policy. How is the worth of a reef measured? Recent methods such as contingent valuation are helping researchers, community members and policy makers to provide a measure of value for non-market goods (like coral reefs).

Within the literature and also within the current marine policy field, there is an emerging consensus about the use of economic tools and also multidisciplinary approaches to environmental problems (Sachs, 2009). Previous management of environmental resources followed a "command-and-control" strategy (Tietenberg, 2000). The goal of this dissertation is to provide information practical and useful for managers, through measuring nonuser value of reefs. Assessing the value of a natural resource such as coral reefs is a complicated problem. To begin with, individuals place value on intangibles like the mere presence of coral reefs (people think coral reefs are beautiful). How does a researcher measure the value of "beautiful"? Secondly, many environmental resources are connected or attached to a system not easily divided into parts. Finally, coral reefs like many ecosystems do not have a clear market. The value of non-market commodities, because they do not have a price, cannot be measured through buyer and seller interaction. This is in part because the buyers for coral reefs (for the many services they provide) have not all been identified. One possible reason coral reefs are on a steady decline towards extinction is because these have not been "priced" properly. The paper hopes to contribute to the literature and to practitioners. This work looks to provide the following contributions to the literature: expanding the literature on coral reef valuation by using a sample of individuals not living near coral reefs; and increasing empirical data on how factors such as ideology, ocean experience, and beliefs influence the Willingness-to-Pay (WTP).

The first goal of this dissertation is to determine the price of coral reefs in Fiji. Usually coral reef contingent valuation (CVM) studies are done by sampling people locally near the reefs. This study will sample Metro Atlanta households which are

considered “far” from Fiji. The uniqueness of this study lies in sampling those individuals who do not live near reefs and determining whether Atlantans are potentially “buyers” of coral reef conservation. Helping to identify the effects of distance on the value of reefs can help communities determine the stakeholders. The more stakeholders are identified and included in policy decisions the more likely the policy is to be viewed as fair and has possibly a better chance at long term success. Furthermore, CVM could help to identify the boundary of care based on the expressed Willingness-to-Pay (WTP) values. The role for CVM might be more critical to policy than previously thought. Chapter 2 discusses in detail previous research on coral reef valuation. Previous work has looked at coral reef value from local, national and local scales. This chapter also includes a description of economic valuation and the limitations of contingent valuation research.

Following a brief overview on the value of coral reefs (Chapter 2), Chapter 3 investigates empirically WTP for coral reef conservation. First the chapter starts with a detailed description of the survey used to collect data for the entire dissertation including pooling of samples, mailing process, survey coding, and data entry. Second, Chapter 3 discusses issues around validity and reliability of survey and CVM data. Third, a brief data section pertinent to the research questions for this chapter is explained containing information about the dependent and independent variables. Chapter 3 presents results and then a discussion and conclusion section about the findings.

Chapter 4 investigates perceptions of households on the scale and magnitude of coral reef problems. This chapter asks whether different factors influence the likelihood of being a particular kind of donor. Donor groups include those who stated they would

give a donation to a Fijian program, a similar program in the US, to both program, or to neither. This chapter begins with an overview of the definition of environmental problems as well as factors potentially influential in how a person might perceive coral reef issues. A methods section containing data models and variables is presented. Following this section, results are provided for each model including descriptive statistics. The chapter concludes with a discussion of the implications of these results particularly on how perceptions of coral reef problems can provide insight on likelihood of donor type.

The final chapter in this dissertation is Chapter 5. This chapter looks at the practical application of coral reef CVM information and its usefulness to practitioners by estimating revenue for various market strategies. Also, the chapter outlines suggestions for managers on improving CVM studies. The dissertation ends with appendices, references and a vita.

CHAPTER 2. Coral Reef Valuation

2.1. The Value of Coral Reefs

Attempts to value coral reef ecosystems as a whole, have yielded conflicting results. Constanza et al. (1997) published an article in *Nature* which measured in dollar value the services provided by ecosystems. The Constanza et al. (1997) number for coral reefs suggested a total global value of $\$375x10^9$/yr at $6,075 per ha/yr. This study received criticisms concerning aggregation of figures across scales, bounding of value questions, and limitations on the type of values of services included (Bockstael et al., 1998). Valuing coral reefs as an ecosystem may be important in setting policy, but far more difficult than measuring one particular service (e.g. diving). Recent estimates suggest total net benefits per year of the world's coral reefs to be around $29.8 billion, of which about $9.6 billion comes from tourism and recreation, $9.0 billion from coastal protection, $5.7 billion from fisheries and close to $5.5 billion in biodiversity (Cesar, Burke and Pet-Soede, 2003; Conservation International, 2008). Table 1 summarizes and lists the studies with coral reef valuation estimates.

When looking at regional values, these all seem to consistently show a large percentage of the benefits being derived from diving and tourism (Conservation International, 2008). Table 1 has summaries on studies with regional estimates of coral reef value. Shoreline protection and or fisheries tie for second. For Southeast Asia, values range around $23,000-270,000 (Burke, Selig, and Spalding, 2002), where as for the Caribbean the net benefits were between $3.1-4.6 billion (Burke and Maidens, 2004).

Table 1. Summary of studies on the value of coral reefs (information used in this table comes from the Conservation International 2008 Report).

Scale	Study	Location	Good being valued	Method	Mean value	Notes
Global	Costanza et. al. (1997)	World			$375x10^9/yr at $6,075 per ha/yr	
	Brander, Florax and Vermaat (2006)	World	Wetlands		$2,800 per ha/yr	
	Martinez, et al. (2007)	World	Coastal Ecosystems	Meta-Analysis	$25,783 billion/yr	Services and Products
	Cesar, Burke, and Pet-Soede (2003)	World	Coral Reefs		$29.8 billion/yr	Net Benefits
Regional	Burke, Selig, and Spalding (2002)	Southeast Asia	Coral Reefs		$23,100-$270,000 per km2 of healthy coral reef	Total potential sustainable annual economic net benefits from fisheries, shoreline protection, tourism, recreation, and aesthetic value
	Burke and Maidens (2004)	Caribbean	Coral Reefs		$3.1-$4.6 billion (dive tourism $2.1 billion, shoreline protection $700-2.2 billion, fisheries at $300billion)	Net benefits provided by coral reefs through fisheries, dive tourism, and shoreline protection
Site-Specific	Cesar et al. (2000)	Jamaica (Portland Bight Area)	Coral Reefs		$52.6 million (25yr NPV, 10% discount; fisheries $19.0 million, $11.0 million tourism, $4.0 million carbon sequestration, $366,000 for coastal protection and $18.0 million for biodiversity	

cont. Table 1.

	Ruitenbeek and Cartier (1999)	Jamaica (Montego Bay)	Coral Reefs		$400 million (tourism and recreation $315.0 million, $1.3 million for fisheries, and $65 million for coastal protection; biodiversity NPV of $13.6 for tourists and $6.0 million for Jamaica residents)	
	Gustavson (1998)	Jamaica (Montego Bay Marine Park)	Coral Reefs		$210-$630.0 million	Lower value represents discount rate of 15% and higher value a discount rate of 5%
	Carleton and Lawrence (2005)	Turks and Caicos Islands	Coral Reefs		$47.3 million/yr (tourism and diving $18.2 million/yr, fisheries $3.7 million/yr, coastal protection $16.9 million/yr, biodiversity $4.7 million/yr)	
	Berg et al. (1998)	Sri Lanka	Coral Reefs		$140-$7.5 million/km2 (20yr period)	
	Seenprachawong (2004)	Phi Phi, Thailand	Coral Reef (biodiversity)	CVM	$497.4 million/yr, $15, 118 per ha/yr	WTP = $7.17 domestic WTP = $7.15 international
	Access Economics (2007)	Australia Great Barrier Reef	Coral Reef (total economic contribution tourism, recreational, commercial, cultural)		$3.7 billion/yr	

cont. Table 1.

	JacobsGIBB Ltd. (2004)	American Samoa	Coral Reefs		$5.1 million/yr	
	Van Beukering (2006)	Commonwealth of the Northern Mariana Islands	Coral Reefs	TEV	$61.2 million/yr (market values were 73% and the rest was non-values; tourism $42.3 million/yr, fisheries $1.3 million/yr,	
	Van Beukering et al. (2007)	Guam	Coral Reef	TEV	$127.3 million/yr ($94.6 million/yr tourism, $8.7 million/yr diving and snorkeling, $4.0 million fisheries, $2.0 million/yr biodiversity, $8.4 million/yr coastal protection)	
	Cesar and Van Beukering (2004)	Hawai'ian Islands	Coral Reefs		$364 million/yr (Net present value of $10 million per year for 50 yrs with a discount of 3%)	
	Hargreaves-Allen (2004)	Indonesia's Wakatobi National Park	Coral Reefs	Total Economic Value	$308,000 or $12,000/km2 (Net present value over 20 years at discount of 10% is $2.6 million)	
	Samonte-Tan et al. (2007)	Philippines	Bohol Marine Triangle Reefs		$11.5 million (Net benefits; coral reefs provide $1.3 million in annual revenues)	

cont. Table 1.

	Samonte-Tan and Armedilla (2004)	Philippines	South China Sea Reefs		$449 million (over 20 yrs with a discount of 10% NPV at $266,112 per km2)	
	Arin and Kramer (2002)	Philippines	Coral Reefs (shoreline protection, fisheries, tourism and aesthetic value)		$850,00-$1.0 million on Mactan Island $95,000-$116,00 in Anilao $3,500-$5,300 on Alona Beach	
	White, Vogt and Arin (2000)	Philippines			$1.4 billion to the economy	

Notes: Net Present Value (NPV)

Valuation estimates have also been done at the country level. The total economic value of the Commonwealth of the Northern Mariana Islands was estimated at $61.2 million per year (Van Beukering, 2006), Hawaiian Islands at $364 million annually (Cesar and Van Beukering, 2004), and Indonesia at $308,000 (Hargraves-Allen, 2004). All of the previously mentioned estimates lack figures on values for individuals distant to these resources, and thus to some extent excluded non-use value measures. Some, such as the Hawaii study, included estimates of indirect values.

All of the valuation studies on coral reefs have been done in areas where coral reefs are present (Hawaii, Florida, Jamaica, Thailand; Table 2). Two methods have dominated in coral reef valuation: Contingent Valuation Method (CVM) and the Travel Cost Method (TCM). Both methods are used to measure the value of non-market goods. CVM directly measures the Willingness-to-Pay (WTP) of coral reefs (within a specific scenario), and TCM uses the amount of expense incurred to travel to coral reefs as a measure of its use value (Arrow et al., 1993; Bockstael et al., 1998; Cesar et al., 2002; Furst et al., 2000; Hanley, 2000; Spash et al., 2000; Stavins, 2000; Whitehead, 2000). Attempts at valuing coral reefs have been usually about measuring WTP for a tax on diving for reef conservation, WTP to limit fishing and WTP to improve biodiversity/reserve (Cesar et al., 2002; Furst et al., 2000; Hanley, 2000; Spash et al., 2000; Seenprachwong, 2001). To date there do not seem to be any CV studies of coral reef valuation done in a location with no natural coral reefs.

WTP studies for coral reefs have differed by sample and scenario (Table 2). One study in Phi Phi Islands, Thailand asked 529 participants (400 local and 129 international) how much they would be willing to pay to conserve coral reefs

(Seenprachwong, 2001). They were asked whether they would be willing to pay a determined amount to a trust fund to restore reefs completely where the amount ranged between $1-50.00/yr. Results indicated an average WTP of $7.71 (Seenprachwong, 2001). Another study in Bonaire Island found participants' average WTP at $27.40 for recreational fees, much higher than the $10.00 currently being charged (Furst et al., 2000). Montego Bay visitors (Jamaica) and Curacao were asked WTP for an increase in coral cover as non-use benefit (Spash, 2000). Responses were significantly related up to a factor of three with how the individual perceived the rights of people to protect the reef or of the inherent rights of the ecosystem.

A large-scale valuation study of the Hawaiian Islands by Cesar et al. (2002), using an approach from Leeworthy and Wiley (2000), found Hawaiian households WTP $10 per year (residents and divers/snorkelers). The study looked at WTP for many aspects, in particular non-use values. The non-use values were defined around biodiversity (preservation) and the assumption was that people are WTP for some good or service even if they do not use it (Cesar et al., 2002). Cesar et. al (2002), prior to the WTP study, found Hawaiian residents to be highly involved with coral reef activities. Implied in the values assigned was the participation factor related to closeness to reef.

Table 2. CVM studies on Coral Reefs (studies presented in this table are to provide a summary of some of the CVM literature on coral reefs; each study differs by scenario and location and therefore WTP estimates are not comparable).

Study	Location	Sample	WTP Estimates	Scenario
Seenprachwong, 2001	Thailand	529 participants (400 local and 129 international	$7.71	Donation for a trust fund to restore reefs completely
Furst et al., 2000	Bonaire	participants	$27.40	Recreational fees
Spash, 2000	Jamaica and Curacao	Montego Bay visitors		Increase coral reef cover as non-use benefit
Cesar et al., 2002	Hawaii	152 interviewed about 97 surveys	$10 (residents)/$3 (mainlanders)	Donate for better diving experience and a fee for marine conservation

Assumptions of WTP for mainlanders appear to be that these participate less; their study found a $3 per household WTP for this group which is much lower compared to the residents WTP for Hawaiian biodiversity preservation (nonuse value). Coral reef valuation studies seem to suggest various factors influence WTP. First, the scenario obviously affects the amount stated. Second, participation and distance to amenity seem linked to WTP. Logic would indicate travel costs are influencing participation. Living near coral reefs decreases travel costs. Those who participate are more likely to have a higher value for coral reefs than individuals who do not live near corals (participating less). On average, traveling to Hawaii is far more expensive than traveling to Florida (i.e. hotel, flights, food costs less) and therefore likely more people have visited Florida than Hawaii. A national survey found 10% of people in the US participated in at least one marine activity in Florida (Leeworthy and Wiley, 2001). The Florida Keys contain

various types of unique corals, are an area of coral reef research, and have popular dive sites. Hawaii has far more diversity in corals and the reefs are in much better health, yet only 2.2% of the population of the U.S. participated in at least one marine activity in Hawaii (Leeworthy and Wiley, 2001). Third, research suggests quality and uniqueness of coral reef, size of population near the reef, and environmental awareness will all be positively related to non-use values (Spurgeon, 1992).

2.1.1. Economic Valuation

Economic valuation can be defined as the measurement of the value of goods and services in monetary terms, and there are several ways of determining value (Bateman et al., 2002). In more simple terms, economic value reflects the importance of desirability and is just "an answer to a carefully defined question in which two alternatives are being compared." (Bateman et al., 2002; Bockstael et al., 1998; Cesar et al., 2002) This study limits value to an economic view, but acknowledges the existence of other valid definitions. Estimating the value of coral reefs has been done primarily through the contingent valuation method (CVM) or using a travel cost analysis (TCM) (Cesar et al., 2002). Both are methods commonly used to estimate economic value of non-market goods, such as coral reefs (Cesar et al., 2002; Hanley, 2000). The contingent valuation method has an advantage over other non-market methodologies; CVM can measure both *use* as well as *non-use* values (Bateman et al., 2002; Stavins, 2000; Tietenberg, 2000; Mitchell and Carson, 1989; Cesar et al., 2002; Spurgeon, 1992).

The total value of a good includes the use value (i.e. goods or services experienced directly by the individual) and non-use value (sometimes referred to as

existence value or passive value). For example, for coral reefs diving and fishing would fall under use values, whereas biodiversity or ecosystem function might be labeled non-use values.[1] There are various types of non-use values such as bequest, altruism, or existence. Recently, researchers have suggested the inclusion of the 'warm glow' effect (moral satisfaction that the individual did something-the warm glow of giving) as another specific value (Nunes and Schokkaert, 2003).

Three problems are usually cited when discussing economic valuation: 1) people are not always well informed about the good in question and their response reflects their lack of knowledge, not value; 2) WTP statements are constrained by income but income is not fairly distributed; and 3) differing sets of preference exist (consumer vs. civic preferences) with differing type of actions (Bateman et al., 2008). In order to address some of the problems mentioned, questions about coral reef knowledge, household income, donation behavior and motivation behind their choices are embedded in the study survey. Even with its limitations, CVM remains the best method at assessing economic value of non-use goods (Arrow et al., 1993; Carson et al., 2000; Mitchell and Carson, 1989). The other two methods for non-market valuation, Travel Cost Method and Hedonic Method, both measure use value not nonuse.

2.1.2. Contingent Valuation

The theoretical framework for CVM states individuals have preferences which are subject to income constraints. When presented with a change from one environmental state to another, individuals are asked what amount would be needed to compensate them

[1] For a detailed description of previous valuation studies of ecological goods and services of coral reefs see Moberg and Folke (1999).

for remaining at the initial state, or how much would the person be willing to pay to move to the changed state (improved state). WTP represents the compensated surplus (or also called compensated variation) and it is the maximum "sum of money the individual would be willing to pay rather than do without the improvement (Bateman et al., 2008)." The use of WTP instead of willingness to accept (WTA) is recommended because WTP is constrained by income. Since WTA figures are not bound by a limit; individuals could demand infinite level of compensation to forgo the environmental improvement. Estimates using WTA estimates are likely to be problematic because these are tend to be less conservative then WTP. This study will use WTP as the measure for economic value.

In CVM studies, people are generally asked to state their preferences within a particular scenario under the constraints of the person's income (Carson, 2000a, 2000b; Carson et. al., 2000; Carson et al., 2003; Diamond and Hausman, 1994). People are usually asked what they would be willing to pay (WTP) to acquire or safeguard a particular good or service (Hanley, 2000). Willingness to pay (WTP) is a total value of the good because it represents both use and non-use value (Carson et al., 2000). WTP can either measure the benefit or cost to decrease or increase the level of provision of a good or service (Carson et al., 2000). Basically CVM constructs a hypothetical model of a market and this is presented to the person. An individual's WTP might depend on (Arrow et al., 1993; Hanley, 2000; Loomis and White, 1996; Stavins, 2000):

- how the market is described,
- knowledge about the good,
- budget, preferences, and
- availability of a substitute and complement.

Typical CVM studies include the following components (Boyle, 2003; Carson et al., 2000; Mitchell and Carson, 1989; Whitehead, 2000):

- Introductory section (context or scenario)
- Detailed description of the good or service being offered
- Institutional setting providing the good
- Payment method
- Method of elicitation
- Debriefing questions
- Questions on the characteristics of the respondent (attitudes, demographic information and other)

2.1.3. Limitations of CVM

Concerns over CVM include: people do not always tell the truth, there are aggregation problems, nesting issues (whole versus part), and lexicographic[2] preferences (Arrow et al., 1993; Arrow et al., 1995; Diamond and Hausman, 1994; Hanley, 2000; Kahneman and Tversky, 1982; Sagoff, 1998; Spash et al., 2000). When individuals' are asked about their preferences concerning unfamiliar goods, responses, specifically WTP estimates, will likely have high levels of uncertainty and variance (Bateman, Burgess, Hutchinson and Matthews, 2008). Consistent preferences are usually gained through experience, practice and repetition; as the person knows more about the good then his/her preferences will become more consistent (Bateman et al., 2008; Plott and Zeiler, 2005). Thus when stated preference methods are used like CVM, initial valuations may be based on poorly formed preferences and those with more experience are likely to have more consistent preferences (Bateman et al., 2008). Another concern is about context effects, both concerning how the good of interest is presented in the survey as well as the environment in which the questions are asked. Both payment vehicle and level of

[2] When a person is presented with two goods, X and Y, where X is preferred over Y, the person will choose the bundle with the most X.

anonymity can affect valuation estimates (Alpizar, Carlsson and Johansson-Stenman, 2008).

Whole-versus-part bias or nestedness issues have been suggested as a serious problem for CVM studies. Those studies which fail the 'scope' test (assesses if the "more is better" economic principle is present), tend to be marked as unreliable responses. In CVM studies, the person should prefer more of the good and therefore place less value on the lower quantity of the good. Problems arise in part because goods such as ecosystems are complex and not easily divided into parts that people have experience with. Other issues concerning nestedness arise when individuals have some value not just for themselves but for the benefit of a larger community, including this in their estimates (warm-glow effects).

Lexicographic preferences-unwillingness to accept/trade compensation for changes in a good-are also problematic for CVM research (Rosenberger, Peterson, Clarke and Brown, 2001, 2003). When present, lexicographic preferences limit the ability to show clear continuous indifference curves and therefore the true value of the environmental good is likely to be biased. Limited or incorrect understanding about individual preferences can lead to erroneous information for policy makers (Rosenberger et al., 2001).

All of previously mentioned concerns attack the validity of responses from CVM research. People do not always tell the truth. Numerous techniques have been developed to mitigate CVM limits. Many of problems with CVM research can be alleviated with careful research design and by taking into account survey guidelines (Arrow et al., 1995; Mitchell and Carson, 1989; Boyle, 2003; Whitehead, 2000). Discussion about how this

research addresses validity and reliability can be found in the Validity and Reliability section within the Methods section.

2.2. Willingness-to-Pay and Donation Behavior

In the CVM literature various factors have been identified as significantly related to WTP, such as income, age, and education (Svensson, Rodwell and Attrill, 2008). As income increases usually so does WTP; this also holds for education where those with more tend to have slightly higher WTP (Svensson, Rodwell and Attrill, 2008). There are still some gaps in the literature on how information influences WTP and whether those individuals with more familiarity about the subject surrounding the scenario will report higher values. There is a growing literature on how scenario composition and length affects responses. However, there is limited understanding on what kinds of information might be related to WTP, particularly around coral reef studies. A person's experience about ocean and marine resources does not necessarily lead to higher WTP values or higher likelihood of donating towards programs/polices about these environmental goods. Studies about information and knowledge effects on level of care (i.e. donations or participation) about marine ecosystems have been done primarily by and in aquariums. For a complete literature review of previous studies by zoos and aquariums see Dierking et al. (2006).

Most of these past studies have suggested new information has less impact on those already with prior knowledge (Doering, 1992; Dunlap and Keller, 1989), characteristics of the visitor (environmentalism) and quantity of information result in different outcomes (Hayward, 1998), passive experience is not likely to increase

conservation effort (Swanagan, 2000); Goldowsky, 2000), long-term effects are still not known (Adelman and Falk, 2000; Adelman et al., 2001), and most studies have design problems leading to inconclusive results. Some studies have found aquarium visitors do learn and know more about oceans when they leave the aquarium (Falk and Adelman, 2003), but other findings suggest a single visit does not significantly expand understanding of the larger issues (Arnold, 2004; Belden et al., 1999; Dierking et al., 2006). There are other factors related to information effects and temporal learning issues, previous experience, and socio-cultural characteristics of the individual (Stein et al., 2006). Previous studies in settings similar to aquariums have looked at measuring visitor learning (Falk and Adelman, 2003; Spotte and Clark, 2004), conservation action (Swanagan, 2000) and attitude (AAAS, 2001) but have produced contradictory results (Dierking et al., 2006; Falk and Adelman, 2003; Stein et al., 2006). Rarely do studies look at all three at the same time. In summary, context and environment, information type and source, and socio-cultural-educational characteristics of the individual are related to the individual's conservation knowledge, behavior and values. There are still questions about which types of information experiences or behaviors influence WTP.

There are two types of information both problematic for the validity of WTP responses-information within the scenario provided in the survey and information "native" to the person (Cameron and Englin, 1997). First, the information provided in the survey about the scenario informing the WTP question must be clear to those answering the survey (Mitchell and Carson, 1989; Berrens et al., 2004). If the scenario is not believable then responses do not reflect WTP; individuals who are unable to clearly understand consequences to their statements on WTP give unrealistic estimates. If the

scenario is interpreted differently by different people based on unclear or insufficient description of the good, then the results are not comparable and thus WTP is not reliable. If a person is unclear about which good is being valued this can also lead to biased responses/inaccurate WTP estimates (Boyle et. al., 1993; Diamond and Hausman, 1994; Whitehead et al., 1995; Cameron and Englin, 1997; Kniivilä, 2006). There is a fine balance between 'too little' or 'too much' information. If the study requires a long description of the survey scenario, the study runs the risk of boring the respondent and having them either skip the question, answer without thinking, or annoying the person to the point of no response. Providing the right information can lead to a reduction between the true and stated WTP. Survey pre-testing can help manage some of these issues prior to implementation and thereby minimize bias.

"Native" knowledge (a person's amount information and or experience about the environmental good), as stated by Cameron and Englin (1997), maybe be higher for those that are users compared to nonusers. Carson et al. (2001) argued for well defined preferences to be present the individual should have direct experience with the good being valued. In other words, those with answering the survey no coral reef experience would have less valid answers and these could not be trusted, whereas as those respondents with diving and snorkeling reef experience, their responses would be considered more valid. Knowledge and familiarity of the good need not only come as direct user experience (Kniivila, 2006). Lack of familiarity with coral reefs could also impact the magnitude of the WTP estimates (Cameron and Englin, 1997; Kniivila, 2006). One of the primary concerns when using information as a variable in a WTP model

concerns endogeneity- when there is a correlation between the error term and observed variables (Louviere et al., 2005).

In binary choice models, researchers suggest a variety of ways to deal with endogeneity. Some suggest using a "control function" approach (Villas-Boas and Winer, 1999; Blundell and Powell, 2001) where the endogenous variable is regressed against exogenous instruments and the residual is entered in the regression as an additional explanatory variable. Another approach is to use other endogenous variables, but only to the endogenous variables of interest, through some exogenous perturbation (Matzkin, 2004; Louviere et al., 2005). Also another way in which researchers have attempted to deal with endogenous effects (for binary choice models) is to use "very exogenous variables".

Knowledge about a particular issue is usually related to the motivations of the person. Results from Martin-Lopez, Montes and Benayas (2007) study on the valuation of ecological services of the Doñana National and Natural Park (Spain) found knowledge and environmental behavior positive and significantly related to WTP. They find knowledge had a higher degree of impact on WTP than environmental behavior; they go on to suggest this as evidence for the continued support of education programs. Berrens et al. (2004) conducted a survey specifically testing how much knowledge impacted WTP answers for people being asked about global climate change.

In the non-profit management literature, various factors have been suggested that influence the likelihood of a donation. Yet at the same time, Ranganathan and Henley (2008) state a need to learn more about individual charitable attitudes (Ranganathan and Henley, 2008). Variables cited in the literature as influential on a charitable donation

include attitudes toward an organization (Webb et al., 2000), altruism (Piliavin and Chang, 1990), involvement (Chiang, 2003), donor characteristics (Pessemier et al., 1977), and size of request (Reingen, 1978). A recent article by Andreoni et al. (2003) found the amount of donation and number of charities from a household differed depending on who was making the donation. Women were more likely to donate to more charities but lesser amounts to each one. Households where one person made donation decisions lead to a 6% decrease in total amount of charitable contributions. Different factors have been linked with donation behavior, some of which may have more impact on WTP for coral reefs. Some of these will be tested in the dissertation research.

All of the previous coral reef valuation work has been done in areas with coral reefs (Cesar et. al., 2002). To date, no studies have sampled populations without reefs. The valuation literature for coral reefs is therefore incomplete, missing information about how individuals who do not live near reefs – and who are not currently visiting them – value this ecosystem. Using data from the "Coral Reef Survey 2008", the models tested whether previous ocean experience, recycling behavior, culture experience, information source, and personal characteristics were predictive of WTP for Fijian coral reef conservation by Atlanta households. The information from this research could be used to inform possible market-like tools, advise non-profits on stakeholders' location and identify potential non-use value.

CHAPTER 3. Willingness-to-Pay for Fijian Coral Reef Conservation

3.1. Research Questions

Valuation studies of coral reefs are gaining demand as the resource becomes more depleted and as policy-makers and program managers face decisions about what to conserve. The larger portion of coral reef valuation research has focused on learning user and local value. This leaves a somewhat incomplete picture of the total value of these ecosystems. A large assumption, which many policy decisions are based on and constrained by, relate to the distance between the people and the environmental good. Closer issues tend to be given priority and thus assumed to be of more value and higher level of public concern. Households and communities near coral reefs might view these as having high cultural, economic and environmental value. Previous valuation studies on reefs to some extent support that assumption; tourists, divers and locals appear to have positive value of coral reefs. There is less empirical data on the value of reefs by those individuals living distant to reefs and whether these people have positive negative or no value. The main goal of this paper is to investigate whether Atlanta households-located far from Fiji-value Fijian reefs and how this estimated value compares to other coral reef value estimates based on users. To date, this study seems to be the only one measuring coral reef value using a sample distant from the reefs of interest.

This chapter asks the following questions: 1) what is the Willingness-to-Pay (WTP) by Atlantan's for the Fijian "Adopt-a-Coral" program and is the value of this nonuser group positive?; and 2) what factors predict WTP? Thus the study hypothesizes the Atlanta sample will have WTP values lower than those in previous similar coral reef

valuation studies, and the value will be greater for individuals with higher levels of income, recycling, ocean experience, and 'cultural activity' participation.

3.2. Methods

3.2.1. Samples

A contingent valuation survey was constructed and implemented during 2007-2008 where 2000 households in the metro Atlanta area were mailed a survey. The dissertation is based on data collected from the *Coral Reef Survey 2007*.

Sample selection was based both on location (getting a sample from Atlanta) to compare to a Fijian sample (future research) and convenience. The rationale behind using a stratified random household sample was to gather data about the public. Free lists are generally not easily available of household addresses, therefore a sample was purchased.[1] The secondary sample was a convenience sample gathered at a Garden conference included and pooled with the original mail sample.

Suggested complete sample size is 1,066 for a 95% CI with a sampling error ±3% (general acceptable mail surveys-Dillman, 2007) for a heterogeneous population of about 500,000 or more. When looking at CVM studies, samples and response rates vary greatly. Mitchell and Carson (1989) provide tables with suggested sample size by Type I and II errors. They suggest CVM studies set $\alpha = 0.10$ and $\beta = 0.10$ or 0.20 to get completed usable WTP samples (smaller values tend to be too expensive for most researchers)[2]. These tables assume the study knows the coefficient of variation

[1] For details on the SDR Sampling Protocol see Appendix A

[2] Alpha α or also known as Type I Error is the probability of rejecting the null hypothesis when the null is true (false positive) and Beta β (Type II Error) is the probability of wrongly retaining the null hypothesis (false negative).

($V=S_p/X_1$), and percentage difference. Mitchell and Carson find V for CVM studies range between 1.0-3.0; they recommend using V=2.0, a conservative assumption of the value for V. If this study assumes $\alpha = 0.10$ and $\beta = 0.20$ with V=2.0 to detect a 2% difference rate, the sample size would be 1,714 (two-tailed) or 902 (one-tailed). Using guidelines provided by both Dillman (2007) and Mitchell and Carson (1989), this study suggests a final complete sample around 1,500. If a conservative response rate of 30% is set, then 5,000 households would need to be sent the initial survey. These numbers allow for incomplete cases. Thus, the study would be 95% confident that the results from the 1,500 would be the same as the population plus or minus a 3% sampling error. Assuming Mitchell and Carson settings for $\alpha = 0.10$ and $\beta = 0.20$. Therefore, there is a 10% chance of committing a Type I Error-rejecting the null hypothesis (no significant difference in WTP figures between poor and non-poor or between minorities and non-minorities or between people who know a lot about coral reefs and those who don't etc.) when it is true. Originally the budget had been planned for a much larger sample. However, because of budget changes the final sample used in the dissertation was 2000 (mail SDR sample).

For a 2000 sample, Mitchell and Carson (1989) suggested complete sample size is 568 for a 95% CI with $\alpha = 0.20$ and $\beta = 0.20$ for a one-tailed t-Test. If a smaller V is assumed a smaller sample is needed, because it would mean the population is more homogenous. When a group is similar fewer observations are needed to make statements about the group. If a 30% response rate is assumed, which is 600 final surveys (out of 2000), this number meets the above Mitchell and Carson requirements. The major difference between the 4000 and this 2000 sample size is due to the $\alpha = 0.20$ being set at

a higher level. Now there would be a 20% chance of committing a Type I error-rejecting the null when the null is true. Also, this is for a one tailed t-Test. For a two-tailed t-Test the final sample would have to be much larger, 1,316 surveys.

A survey was mailed to 2000 households. This stratified sample was purchased from a local sampling company.[3] For details on the SDR sample see Appendix A. Out of the 2000 households surveyed, 168 responded and 57 surveys were returned due to invalid addresses (these were dropped from the sample and not taken into account in the response rate). The final sample resulted in 165 household surveys; 3 surveys were dropped due to their duplicity.[4] Response rate for the mail survey was 8.49%. The sample obtained was drawn from the following several Georgia Metro counties listed in the Appendix A. The survey was sent out in a three wave mailing process beginning in November of 2007 and ending in January of 2008.

Georgia Tech human subject protocols were followed and the necessary IRB forms completed (Appendix B).[5] The research was approved Protocol H07162 as Exempt Review approved 08/03/2007 through completion of the dissertation. The protocol also included pre-testing approval.

A secondary sample was gathered by distributing the survey in person during a Georgia Gardening conference January 25-26 (filled out the survey handed out on Jan. 25) of 2008 Athens, GA (a one-time event). This conference is done twice a year (Winter and Summer), carried out by the Georgia Master Gardner Association Inc.; the

[3] SDR provided 4000 household addresses with phone numbers, names, and block group information (income, gender, age and fips codes). They also were asked to oversample minorities (poor, Hispanic and African American).

[4] Survey ID number 704 was sent in twice for the 1st and 2nd mailing. Similarly for ID number 535, where there were 3 surveys returned one from each wave. I decided to take the first mailing, since likely this was the most unbiased (no prior experience with the survey).

[5] See Appendix for a copy of the IRB acceptance letter.

conference is open to the public and usually attended to by the Master Gardeners, UGA Faculty, Extension Personal or Guest Speakers. A total of 367 surveys were given out to attendees (total conference members) and 82 surveys were returned/completed. Response rate for the secondary sample was 22.3%. The participants were given a survey during the conference and asked to complete it at that time. The completed surveys were deposited in a collection box by conference volunteers. A few individuals mailed their survey back to the researcher[6] and one survey included $2 cash as donation for the program. The survey used for the mailing sample and for the Georgia Master Gardeners Conference (GMGC) sample was the same. Thus, the total final N was 247 surveys.

The response rate for the mail survey was much lower than anticipated. There is a possibility the data cannot be generalizable to the larger Metro Atlanta population. However, the data does provide initial data as to what range of WTP exists within the group sampled.

3.2.1.1. Pooling of Samples

Tests were run to validate the pooling of samples (mailing sample and GMGC sample). Preliminary tests[7] suggested the sample coefficients do not seem to differ significantly and variables for the samples can be treated as if they were the same for both groups. In addition, t-test results found no significant difference between average WTP for the mail sample and GMGC sample.[8]

[6] From this sample, surveys were returned on the same day as they were handed out, some individuals took them home and then mailed them back to the researcher at the School of Public Policy at Gatech.
[7] Chow test F-stat = 0.0128, when testing the regression reg wtp income timeoutdoors oceanxp recycle culturalxp scuba coral (the test was run for X1group1=X2group2 and X1group1=0
[8] t=-0.2093 and p=0.83

3.2.2. Survey

3.2.2.1. Survey Mailing and Implementation Process

The mail sample received the survey in a 3 mailing wave process as suggested by Dillman (2007). The survey and its components were printed at PCS Georgia Institute of Technology[9]; this company also sorted packaged and mailed the survey to the indicated sample addresses. For each mailing a new list was provided of the non-respondents. Each survey was giving a unique ID matching a specific address to be used for matching outgoing envelope addresses with returned surveys. All surveys and return envelopes were printed at the same time (both Survey A and B) but each cover letter and outgoing envelope was printed at each mailing. For a detailed description of the implementation process see Appendix L.

Each household was mailed a survey package comprised of a survey (8pages Self Cover Lynx Opaque White paper folded saddle stitch 5.5x8.5 White and Black ink), cover letter (8x11 folded in half hand signed), outgoing envelope (Outer Catalog envelope 6x9 White Booklet) and return envelope (Business Reply envelope). See Appendix C and D for examples. Each survey had the ID of the household printed on the back page bottom right corner (see Figure 3 the one of the survey with ID on last page). This ID then matched the ID on the outgoing envelope for each mailing. The survey package was sent up to 3 times or until the household returned the survey. Times between mailings ran between 3-4 weeks. For the second and third wave the cover letters varied slightly; for the third and final mailing wave the outgoing envelope also differed

[9] Quotes were requested from various printers including Taylor Printing (previously used by School of Public Policy faculty). The selection of the Gatech Printing Service Company was due to the ability to allow for direct billing to the grant funds. This company had also been used previously by School of Public Policy faculty.

slightly in hopes of encouraging households to respond (Dillman, 2007). For copies of the cover letter, outgoing envelopes, and return envelopes see Appendix L. The sample from the Georgia Master Gardeners Conference (GMGC) only received the survey and was given oral instructions (similar to those in the cover letter).

3.2.2.2. Survey Versions and Questions

Two versions of the survey were created: Survey A-the scenario for this survey was for 10 miles of coral reef conservation; and Survey B- the scenario for this survey was for 4 miles. This was done as a validity check-scope test-a common test in CVM studies. Basically, the mean average WTP for Survey A should be higher than the mean average WTP stated in Survey B. Thinking logically, 10 miles of reefs should be worth more than 4 miles of reefs. Contingent valuation is embedded in welfare economics. Scope tests are generally used to ascertain the validity of the 'more is better' theoretical indicator (Carson et al., 2000). Surveys tend to include questions that ask about how a person values different levels of a good, or assess whether change in price increases or decreases amount desired. Scope tests can help to learn if WTP is increasing with increase in quantity of quality of the good. The scope test for this survey was done by offering two versions of the survey (Survey A and Survey B; see Figure 1 and 2). If the theoretical basis holds (more is better) then the WTP for 10miles should be significantly different from those who stated WTP for 4miles. T-test results for the scope test found no significant difference between WTP for survey A and WTP for survey B ($p=0.69$). Thus, this study is unable to determine if there is a significant difference between WTP responses for 10 miles and 4 miles. Recent work on the scope test as a measure of CVM

validity (Herbelein at al., 2005) suggest conventional scope tests based on the comparison of average values may hide important relationships relevant to validity, and in some cases lead to false positives or negatives. Their scope test went beyond the traditional split sample test and included attitudinal and behavioral scope approaches as well as compared individual and aggregate level scope results. Herbelian et al. (2005) discuss the part-vs-whole as possible different goods and thus a failure in the scope test is not always a failure in survey design.

Version of Survey A and Survey B were identical except for changes in the quantification of the coral reef improvement being sold. Thus out of the 2000 total surveys, a 1000 were A and 1000 were B. Assignment of survey type (A or B) was random and done through Stata Intercooled 8. Survey A and B only differed in scenario section. Figure 1 and 2 are the scenarios for Survey A and Survey B.

The survey was comprised of 32 questions in three distinct sections (see Figure 3 for survey questions). Section 1 was interested in learning about participants' experience (general and environmental), activities (ocean related), and knowledge (coral reefs). Section 2 contained the scenario and the questions related to the valuation scenario. These included the WTP question, motivations, level of sureness to donate stated WTP, and a few other similar questions. Section 3, the final survey section, included questions about religious activity, donation behavior, race, income, age, education, time living in current home, occupation, volunteer experience, number of cars in home, household size (number of children), marital status and overall level of travel. The final page of the survey provided space for subjects to write comments.

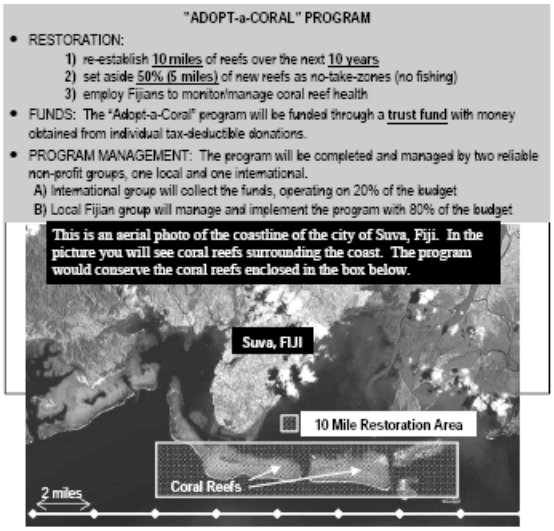


Figure 1. Scenario from Survey A.

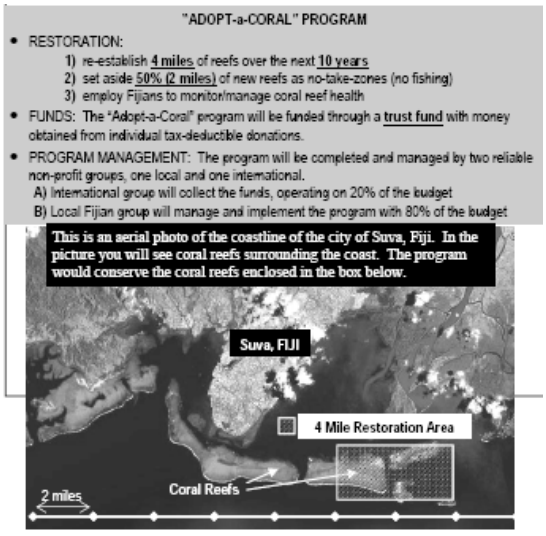
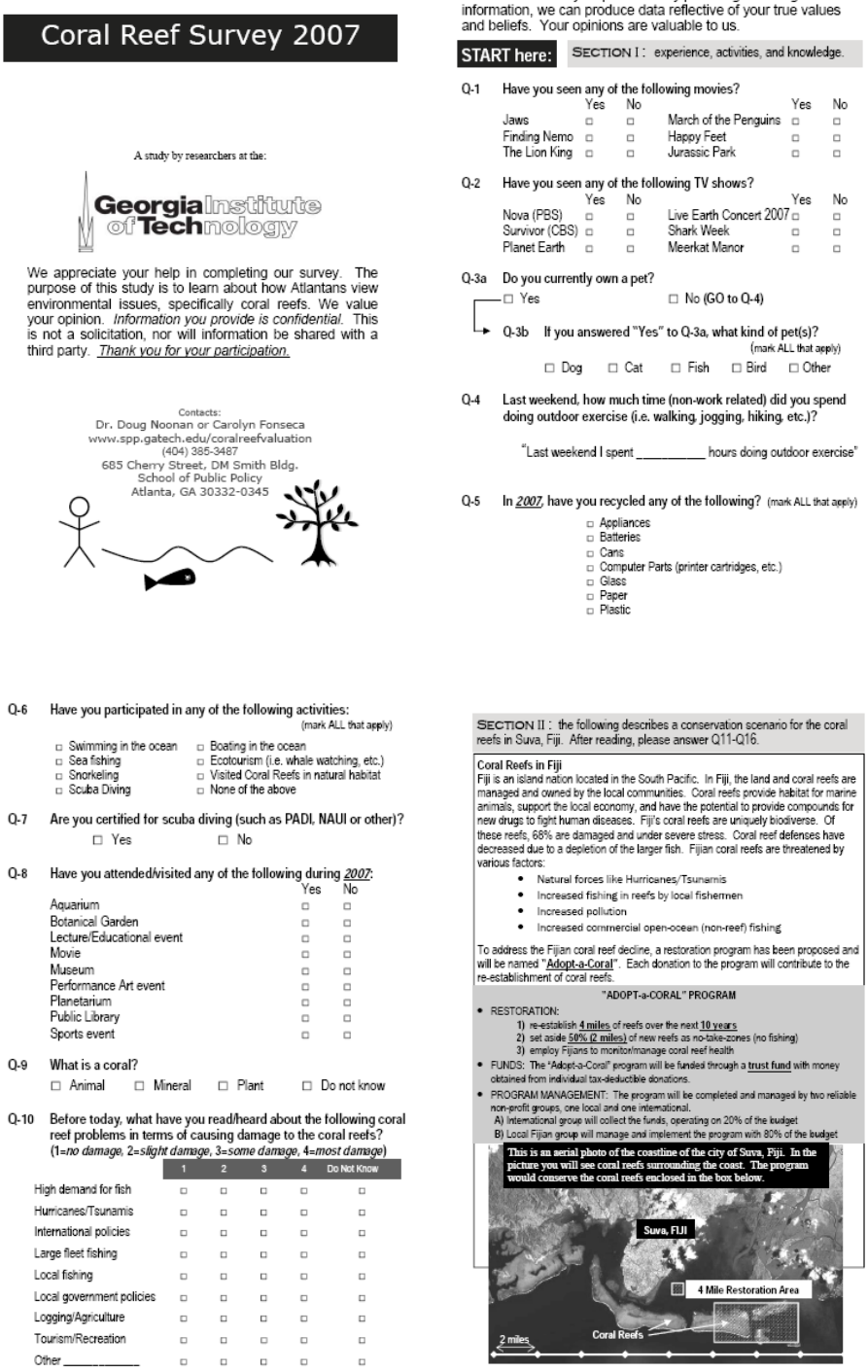


Figure 2. Scenario from Survey B.



Coral Reef Survey 2007

A study by researchers at the:

Georgia Institute of Technology

We appreciate your help in completing our survey. The purpose of this study is to learn about how Atlantans view environmental issues, specifically coral reefs. We value your opinion. *Information you provide is confidential.* This is not a solicitation, nor will information be shared with a third party. *Thank you for your participation.*

Contacts:
Dr. Doug Noonan or Carolyn Fonseca
www.spp.gatech.edu/coralreefvaluation
(404) 385-3487
685 Cherry Street, DM Smith Bldg.
School of Public Policy
Atlanta, GA 30332-0345

Instructions: please read each question carefully and state your answer as truthfully as possible. By providing us with genuine information, we can produce data reflective of your true values and beliefs. Your opinions are valuable to us.

START here: SECTION I : experience, activities, and knowledge.

Q-1 Have you seen any of the following movies?

	Yes	No		Yes	No
Jaws	☐	☐	March of the Penguins	☐	☐
Finding Nemo	☐	☐	Happy Feet	☐	☐
The Lion King	☐	☐	Jurassic Park	☐	☐

Q-2 Have you seen any of the following TV shows?

	Yes	No		Yes	No
Nova (PBS)	☐	☐	Live Earth Concert 2007	☐	☐
Survivor (CBS)	☐	☐	Shark Week	☐	☐
Planet Earth	☐	☐	Meerkat Manor	☐	☐

Q-3a Do you currently own a pet?

☐ Yes ☐ No (GO to Q-4)

Q-3b If you answered "Yes" to Q-3a, what kind of pet(s)? (mark ALL that apply)

☐ Dog ☐ Cat ☐ Fish ☐ Bird ☐ Other

Q-4 Last weekend, how much time (non-work related) did you spend doing outdoor exercise (i.e. walking, jogging, hiking, etc.)?

"Last weekend I spent _____ hours doing outdoor exercise"

Q-5 In *2007*, have you recycled any of the following? (mark ALL that apply)

- ☐ Appliances
- ☐ Batteries
- ☐ Cans
- ☐ Computer Parts (printer cartridges, etc.)
- ☐ Glass
- ☐ Paper
- ☐ Plastic

Q-6 Have you participated in any of the following activities: (mark ALL that apply)

☐ Swimming in the ocean	☐ Boating in the ocean
☐ Sea fishing	☐ Ecotourism (i.e. whale watching, etc.)
☐ Snorkeling	☐ Visited Coral Reefs in natural habitat
☐ Scuba Diving	☐ None of the above

Q-7 Are you certified for scuba diving (such as PADI, NAUI or other)?

☐ Yes ☐ No

Q-8 Have you attended/visited any of the following during *2007*:

	Yes	No
Aquarium	☐	☐
Botanical Garden	☐	☐
Lecture/Educational event	☐	☐
Movie	☐	☐
Museum	☐	☐
Performance Art event	☐	☐
Planetarium	☐	☐
Public Library	☐	☐
Sports event	☐	☐

Q-9 What is a coral?

☐ Animal ☐ Mineral ☐ Plant ☐ Do not know

Q-10 Before today, what have you read/heard about the following coral reef problems in terms of causing damage to the coral reefs? (1=*no damage*, 2=*slight damage*, 3=*some damage*, 4=*most damage*)

	1	2	3	4	Do Not Know
High demand for fish	☐	☐	☐	☐	☐
Hurricanes/Tsunamis	☐	☐	☐	☐	☐
International policies	☐	☐	☐	☐	☐
Large fleet fishing	☐	☐	☐	☐	☐
Local fishing	☐	☐	☐	☐	☐
Local government policies	☐	☐	☐	☐	☐
Logging/Agriculture	☐	☐	☐	☐	☐
Tourism/Recreation	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐

SECTION II : the following describes a conservation scenario for the coral reefs in Suva, Fiji. After reading, please answer Q11-Q16.

Coral Reefs in Fiji

Fiji is an island nation located in the South Pacific. In Fiji, the land and coral reefs are managed and owned by the local communities. Coral reefs provide habitat for marine animals, support the local economy, and have the potential to provide compounds for new drugs to fight human diseases. Fiji's coral reefs are uniquely biodiverse. Of these reefs, 68% are damaged and under severe stress. Coral reef defenses have decreased due to a depletion of the larger fish. Fijian coral reefs are threatened by various factors:

- Natural forces like Hurricanes/Tsunamis
- Increased fishing in reefs by local fishermen
- Increased pollution
- Increased commercial open-ocean (non-reef) fishing

To address the Fijian coral reef decline, a restoration program has been proposed and will be named "Adopt-a-Coral". Each donation to the program will contribute to the re-establishment of coral reefs.

"ADOPT-a-CORAL" PROGRAM

- RESTORATION:
  1) re-establish 4 miles of reefs over the next 10 years
  2) set aside 50% (2 miles) of new reefs as no-take-zones (no fishing)
  3) employ Fijians to monitor/manage coral reef health
- FUNDS: The "Adopt-a-Coral" program will be funded through a trust fund with money obtained from individual tax-deductible donations.
- PROGRAM MANAGEMENT: The program will be completed and managed by two reliable non-profit groups, one local and one international.
  A) International group will collect the funds, operating on 20% of the budget
  B) Local Fijian group will manage and implement the program with 80% of the budget

This is an aerial photo of the coastline of the city of Suva, Fiji. In the picture you will see coral reefs surrounding the coast. The program would conserve the coral reefs enclosed in the box below.

Suva, FIJI

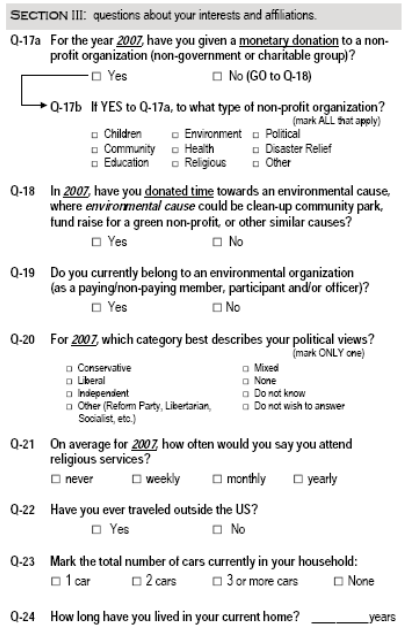
4 Mile Restoration Area

Coral Reefs

2 miles

Figure 3. Coral Reef Survey 2007.

Cont. Figure 3.



SECTION III: questions about your interests and affiliations.

Q-17a For the year *2007*, have you given a monetary donation to a non-profit organization (non-government or charitable group)?

☐ Yes ☐ No (GO to Q-18)

Q-17b If YES to Q-17a, to what type of non-profit organization? (mark ALL that apply)

☐ Children ☐ Environment ☐ Political
☐ Community ☐ Health ☐ Disaster Relief
☐ Education ☐ Religious ☐ Other

Q-18 In *2007*, have you donated time towards an environmental cause, where *environmental cause* could be clean-up community park, fund raise for a green non-profit, or other similar causes?

☐ Yes ☐ No

Q-19 Do you currently belong to an environmental organization (as a paying/non-paying member, participant and/or officer)?

☐ Yes ☐ No

Q-20 For *2007*, which category best describes your political views? (mark ONLY one)

☐ Conservative ☐ Mixed
☐ Liberal ☐ None
☐ Independent ☐ Do not know
☐ Other (Reform Party, Libertarian, Socialist, etc.) ☐ Do not wish to answer

Q-21 On average for *2007*, how often would you say you attend religious services?

☐ never ☐ weekly ☐ monthly ☐ yearly

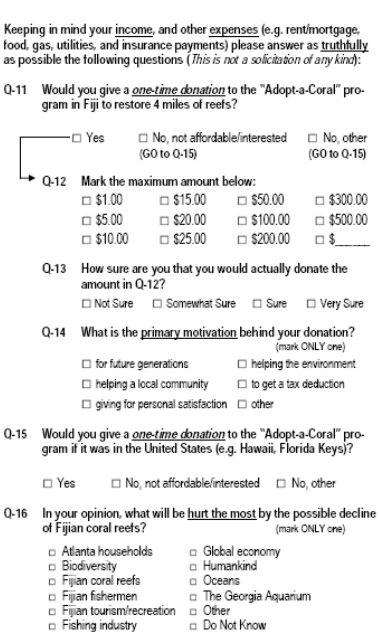
Q-22 Have you ever traveled outside the US?

☐ Yes ☐ No

Q-23 Mark the total number of cars currently in your household:

☐ 1 car ☐ 2 cars ☐ 3 or more cars ☐ None

Q-24 How long have you lived in your current home? _____years



Keeping in mind your income, and other expenses (e.g. rent/mortgage, food, gas, utilities, and insurance payments) please answer as truthfully as possible the following questions (*This is not a solicitation of any kind*):

Q-11 Would you give a *one-time donation* to the "Adopt-a-Coral" program in Fiji to restore 4 miles of reefs?

☐ Yes ☐ No, not affordable/interested (GO to Q-15) ☐ No, other (GO to Q-15)

Q-12 Mark the maximum amount below:

☐ $1.00 ☐ $15.00 ☐ $50.00 ☐ $300.00
☐ $5.00 ☐ $20.00 ☐ $100.00 ☐ $500.00
☐ $10.00 ☐ $25.00 ☐ $200.00 ☐ $_____

Q-13 How sure are you that you would actually donate the amount in Q-12?

☐ Not Sure ☐ Somewhat Sure ☐ Sure ☐ Very Sure

Q-14 What is the primary motivation behind your donation? (mark ONLY one)

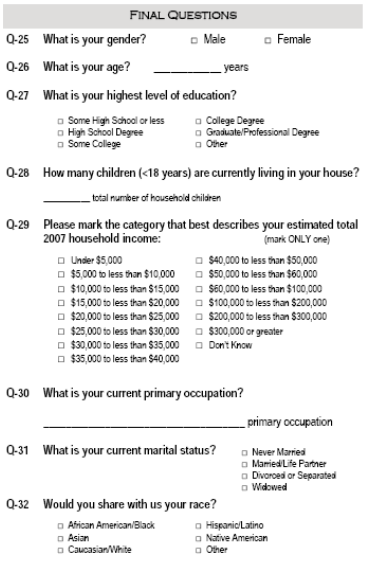
☐ for future generations ☐ helping the environment
☐ helping a local community ☐ to get a tax deduction
☐ giving for personal satisfaction ☐ other

Q-15 Would you give a *one-time donation* to the "Adopt-a-Coral" program if it was in the United States (e.g. Hawaii, Florida Keys)?

☐ Yes ☐ No, not affordable/interested ☐ No, other

Q-16 In your opinion, what will be hurt the most by the possible decline of Fijian coral reefs? (mark ONLY one)

☐ Atlanta households ☐ Global economy
☐ Biodiversity ☐ Humankind
☐ Fijian coral reefs ☐ Oceans
☐ Fijian fishermen ☐ The Georgia Aquarium
☐ Fijian tourism/recreation ☐ Other
☐ Fishing industry ☐ Do Not Know



FINAL QUESTIONS

Q-25 What is your gender? ☐ Male ☐ Female

Q-26 What is your age? _____ years

Q-27 What is your highest level of education?

☐ Some High School or less ☐ College Degree
☐ High School Degree ☐ Graduate/Professional Degree
☐ Some College ☐ Other

Q-28 How many children (<18 years) are currently living in your house?

_____ total number of household children

Q-29 Please mark the category that best describes your estimated total 2007 household income: (mark ONLY one)

☐ Under $5,000 ☐ $40,000 to less than $50,000
☐ $5,000 to less than $10,000 ☐ $50,000 to less than $60,000
☐ $10,000 to less than $15,000 ☐ $60,000 to less than $100,000
☐ $15,000 to less than $20,000 ☐ $100,000 to less than $200,000
☐ $20,000 to less than $25,000 ☐ $200,000 to less than $300,000
☐ $25,000 to less than $30,000 ☐ $300,000 or greater
☐ $30,000 to less than $35,000 ☐ Don't Know
☐ $35,000 to less than $40,000

Q-30 What is your current primary occupation?

_____ primary occupation

Q-31 What is your current marital status?

☐ Never Married
☐ Married/Life Partner
☐ Divorced or Separated
☐ Widowed

Q-32 Would you share with us your race?

☐ African American/Black ☐ Hispanic/Latino
☐ Asian ☐ Native American
☐ Caucasian/White ☐ Other

Thank you for your time and participation!

As a way to thank our participants, we will randomly award one grand prize of $500.00. Good Luck! Should you be the winner, you will receive your prize in the mail.

Please write in the space below any comments or thoughts you wish to share with us.

Steps to Return the Survey
FREE Return Postage

STEP 1	STEP 2	STEP 3
Fold survey in half (long-ways)	Place folded survey in "REPLY envelope" and seal	Drop off at any post office box

Fold Survey Here

Funding Provided by:
The Community Foundation
For Greater Atlanta Inc.

Survey ID _____ B

This research and survey was funded by The Fowler Foundation ($5,000.00), Dr. Kirk Bowman ($1,500.00) and Dr. Gordon Kingsley ($200.00). This added up to a budget of $6,700.00. Also, support for the student's studies was provided by Dr. Doug Noonan and Dr. Bryan Norton from the NSF Boundaries and Scales Project, as well as from Dr. Mary Frank Fox through the NSF Advance Project.

3.2.2.3. Survey Pretesting

The survey was pretested extensively in the summer of 2007. Several focus groups were run to test early versions of the survey. Comments from these were incorporated into the survey, and then this version was sent to the experts. Suggestions from experts were recorded and issues for each question summarized. Their comments were then reviewed by myself and the Chair and added to the survey. Almost all of the changes suggested were incorporated into the survey. The survey then went for review amongst the committee members. After final approval the survey was sent to print.

The survey was tested in two ways. First the survey was pretested through focus groups and taken by undergraduate and graduate students. The second form of pretesting was done via expert review.

Focus Groups

Very early versions of the survey questions and design were tested using students from various Georgia Institute of Technology classrooms. After several consultations with the Chair and Dr. Mary Frank Fox the pretesting version of the survey emerged. Six focus groups were created to test the survey. These were selected based on convenience, location and variety of participants. The first group was a group of high school students

Young Scholars UGA Griffin; about 19 students were given the survey and discussions shortly after that were carried out. Each person was given a small token of appreciation for their participation, and for this group it was a $5.00 giftcard to Barnes and Nobles. For copy of the protocol used by the moderator see Appendix E. The group was given clear instructions about participants' rights and a brief handout with information about the project. The handout was given after the survey was taken so as to not bias responses. The protocol for this group was the same for the other focus groups. Each focus group session lasted between 1-2 hours. The other focus groups included a group of about 15 North Fulton Master Gardeners (GA Gardening Club), a book club from the Griffin public library (7 participants), and 3 focus groups comprised of faculty and students from Georgia Institute of Technology. All participants were given tokens of gratitude, from book markers to stickers to cash prizes. See Appendix N for details on the focus groups. After all the focus groups were conducted and comments incorporated into the survey, this was then tested in a classroom of undergraduate students. This version was then sent to expert reviewers for their opinions.

Expert Review

The sample list of expert reviewers came from prominent articles, books, suggested by committee Chair/Members, and suggested by other experts in their responses. The organization "ReefBase" is known amongst scientists as a reliable source of coral reef research from which names were also collected for the expert review sample. The original list included experts in the fields of coral reefs, coral reef valuation, economic valuation, nonmarket good research, contingent valuation, survey methodology, and environmental economics. A total of 70 experts were in the sample (for a complete list of

all experts see Appendix F). From this number, only 40 had viable addresses and or emails. The final sample of experts was 40 and from this total 16 members dropped, 2 declined, and 15 reviewed the survey. Response rate from the 40 who were mailed the survey package for review was 37.5%.

Each expert was contacted through email first letting them know the survey had been mailed to them for review. The package sent to the experts comprised a cover letter, a brief summary of the thesis, a sample survey, and a return envelope. A copy of the letter and the version of the survey mailed to the experts can be found in Appendices G and H. Most of the comments made by the 15 experts who returned reviews were on the scenario. See Appendix F for information about expert review.

Survey Design for Response Rate

As an incentive to complete the survey, participants were offered a chance to win $500.00 prize (regardless of entering in the study). According to survey research (Dillman, 2007) the strategy leading to the highest response rate is to provide individual rewards within the survey package such as $2.00 bill or similar incentives. Budget constraints constrained the type of reward provided. Yet prizes have been and continue to be used as acceptable forms of rewards to increase survey response rates (Dillman, 2007). Rules for the prize were clearly outlined in the cover letter as well as posted on the website. These rules were as follows:

> "The 500.00 Prize…
>
> As you all know, our study will be giving out one prize of $500.00. We are grateful for your participation.
> We would like to clearly state the rules under which the prize will be given out:

- All participants who were sent the survey were automatically entered for a chance to win the prize. To enter for a chance to win the prize, you do not have to complete or return the survey
- The prize will be given out in March of 2008
- To be eligible to receive the prize you must be at least 18 years of age or older"

To maximize response rates, the survey used Georgia Institute of Technology logos on all components, including the webpage. This research followed guidelines provided by Mitchell and Carson (1989) and Dillman (2007). Furthermore, a webpage and phone were acquired for the project. The webpage was run and managed by the School of Public Policy Webmaster at the address: http://www.spp.gatech.edu/coralreefvaluation. Information about the project including contact information and a copy of the survey were posted for the public and or participants. The contact phone for the project was (404) 385-3487 also a Georgia Institute of Technology phone line.

3.2.2.4. Survey Coding, Data Entry and Analysis

Each survey was coded by the researcher. The surveys where then coded by a secondary person to check for errors. A codebook was created containing all the codes for each survey question. The complete codebook can be seen in Appendix I. Data for all surveys was entered (double blind process) into an excel spreadsheet then imported into Stata. Data analysis was done using Stata and ArcGIS and some descriptive work in Excel. Each specific model and analysis was included in each paper separately.

3.2.3. Validity and Reliability for CVM

Both reliability and validity are largely linked to the level of control over experiment conditions (Smith, 1993). No natural study can control for all spurious factors or limit only to those of interest; CVM studies are no different. However, there are ways to minimize the potential for bias and increase validity and reliability. Methods for enhancing the validity of studies include: avoiding the use of self-administered surveys, use a probabilities sample, pretest questionnaires, be sure the good/service to be valued is realistic, and create a credible payment method (Whittintong, 1992). Reliability is the ability to repeat the experiment or experimental conditions, the ability to replicate the research process resulting in consistent measures (yielding the same results); the credibility of the measuring tool to replicate measurements; reliability is concerned with accuracy of measurement. "Reliability refers to the measurement replicability." (Carson et al., 2000) Validity is concerned with valid measures, where "Validity refers to the correspondence between what one wished to measure and what was actually measured." (Carson, Flores and Meade, 2000).

In the case of CVM work, theory provides some indicators of validity (Carson et al., 2000; Mitchell and Carson, 1989; Bateman et al., 2002). Contingent valuation is embedded in welfare economics. Scope tests are generally used to ascertain the validity of the 'more is better' theoretical indicator (Carson et al., 2000). Assuming the good is a "normal good"[10] (as income increases so does consumption of the good) then the assumption is WTP and income are positively associated. This thesis acknowledges the

[10] This research will define coral reefs as normal goods, even though there are discussions about whether environmental goods are luxury and not normal goods.

problems surrounding the over-simplification of human preferences and people making rational choices.

For the most part, many of the validity issues mentioned previously can be addressed through careful survey design. Questions in the survey can ask about how a person values different levels of a good, or assess whether change in price increases or decreases amount desired. Debriefing questions can help to determine what the person values, what the WTP figure stated represents. Also, debriefing questions can look at whether the simple economic principals are holding. Scope tests can help to learn if WTP is increasing with increase in quantity of quality of the good. Because markets do not exists, where buyer and sellers set prices, individuals are asked questions about WTP under very specific conditions (clearly defined scenario). One advantage of this study is it is based on a real scenario. The "market" is about to be created and the survey will present the scenario equal to the manner presented to buyers. Individuals in the fall of 2008 will be able to go online donate towards coral reef conservation.

The field of CVM has proposed various types of evaluators of validity and reliability. Smith (1993) discusses seven types: 1) "comparison of indirect and CVM estimates of the value of some change in an environmental resource"; 2) "use constructed markets in which commodities not usually sold were offered for sale and the results compared with CVM estimates for the same commodity"; 3) "evaluation of CVM for measuring the demand for actual marketed commodities of programs in comparison with actual demands"; 4) "test/retest comparisons of the stability of CVM estimates from the same sample over time"; 5) "creation of laboratory experiments in which hypothetical and actual sales of commodities were undertaken"; 6) "surveys of purchase intentions and

actual sales of commodities"; 7) "and nonparametric 'tests' of the consistency of CVM and travel costs estimates with the strong axiom of revealed preference theory." (Smith, 1993; page 8-9) Hypothetical Bias – Groothuis, Groothuis and Whitehead (2006) added a certainty rating question in their CVM survey to mitigate hypothetical bias (actually doing the behavior). They asked: "for those respondents who say that they are willing to pay we ask: 'On a scale from 1 to 10 where 1 is not sure at all and 10 is definitely sure, how sure are you that you would make the one-time donation of the tax amount" (page 9).

Carson et al. (2000) suggest two common approaches to determining validity: construct validity (are expectations of predictions met) and convergent validity (comparing two techniques and their measurements). Scholars like Mitchell and Carson (1989), Blue Ribbon Panel (Arrow et. al., 1993), Boyle (2003) and Whitehead (2000) all suggest ways to address validity and reliability in CVM research. Table 3 outlines the general issues of concern when conducting empirical work. The three main approaches to assess validity in CVM and used in this project are (Boyle, 2003; Mitchell and Carson, 1989):

- Criterion-comparing WTP results with another measure
    - The information from sales of corals online in Fall 2007 might be out in time to compare to the CVM study results
- Construct-deals with how the results compare to theory predictions
    - Pretests (relationships between income and WTP, and other theory based assumptions)
    - Scope tests

- Content-quality of the measure instrument
    - Pretests (preliminary data has already begun to suggest problems with question format and wording)
    - Focus groups
    - Send survey to experts (Whitehead, Carson, Boyle, Spurgeon or Cesar)
    - Using previous CVM surveys and Dillman guidelines to construct questions

Table 3. General steps for the creation, implementation and analysis of a CVM study (Boyle, 2003).[11]

Creation Step
Identify the change in quantity/quality to be valued
Identify whose values are being estimated
Select a data collection mode
Choose a sample size
Design the scenario
Design the contingent valuation question
Develop auxiliary questions
Pretest and Implement the survey
Develop data analysis procedures and conduct statistical analysis
Report results

[11] Boyle (2003), page 116 Table 1 describes in detail the steps in CVM research.

3.2.4. Data

Data was taken from the "Coral Reef Survey 2007" and included both samples. The mail survey sample is comprised by households located within the Atlanta area and a few surrounding counties (See Appendix for sampling details). These could include individuals with some or no interest in environmental issues. The gardening conference sample is comprised by individuals who have joined the Master Gardener clubs of the state of Georgia. These individuals tend to be older retired and with free time to volunteer the required hours to remain in the GA Master Gardener organization. The group is largely comprised of both Caucasian men and women from middle to high income levels.

With a total of 32 questions, the survey was divided into three sections. Survey for details about the instrument). Section I contained questions about the participants' experience activities and knowledge. Section II included the WTP scenario and related questions. Section III was comprised of questions concerning values, travel, and demographics. Total number of survey respondents was 247.

The scenario presented to participants was built to reflect the question of interest for the program "Adopt-a-Reef". This program has recently been implemented in Fiji by the non-profit *Sasalu Tawamudo* Fiji[12]. This group has an online donation system for mangroves, coral reefs and coral reef areas. The goal of the program is to gather a larger support base to fund and help maintain the conservation program. Each survey participant was given a brief description of the program followed by a map indicating the amount of reef (10miles or 4miles depending on which survey version was received) to be conserved.

[12] http://sasalutawamudu.org/about.html

SECTION II : the following describes a conservation scenario for the coral reefs in Suva, Fiji. After reading, please answer Q11-Q16.

Coral Reefs in Fiji

Fiji is an island nation located in the South Pacific. In Fiji, the land and coral reefs are managed and owned by the local communities. Coral reefs provide habitat for marine animals, support the local economy, and have the potential to provide compounds for new drugs to fight human diseases. Fiji's coral reefs are uniquely biodiverse. Of these reefs, 68% are damaged and under severe stress. Coral reef defenses have decreased due to a depletion of the larger fish. Fijian coral reefs are threatened by various factors:

- Natural forces like Hurricanes/Tsunamis
- Increased fishing in reefs by local fishermen
- Increased pollution
- Increased commercial open-ocean (non-reef) fishing

To address the Fijian coral reef decline, a restoration program has been proposed and will be named "Adopt-a-Coral". Each donation to the program will contribute to the re-establishment of coral reefs.

"ADOPT-a-CORAL" PROGRAM

- RESTORATION:
  1) re-establish 10 miles of reefs over the next 10 years
  2) set aside 50% (5 miles) of new reefs as no-take-zones (no fishing)
  3) employ Fijians to monitor/manage coral reef health
- FUNDS: The "Adopt-a-Coral" program will be funded through a trust fund with money obtained from individual tax-deductible donations.
- PROGRAM MANAGEMENT: The program will be completed and managed by two reliable non-profit groups, one local and one international.
  A) International group will collect the funds, operating on 20% of the budget
  B) Local Fijian group will manage and implement the program with 80% of the budget

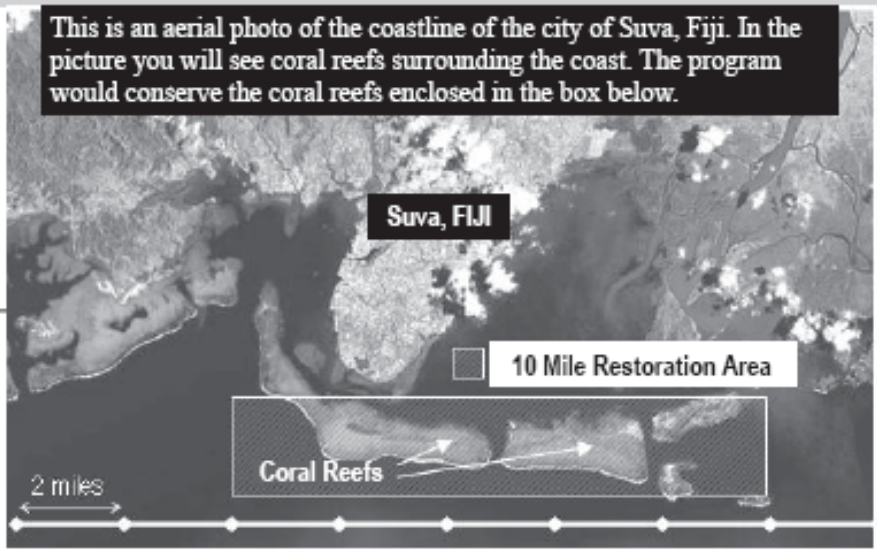


Figure 4. Scenario presented in the Coral Reef Survey 2008 to all participants.

The scenario begins with a brief description of Fiji (Figure 4), coral reefs and their issues. Then the scenario describes the program including amount of reef to be conserved, location (map), and organization financial structure. Details about the selection of the length and type of information can be found in previous sections. The WTP question was designed in a payment card format. Previous literature has suggested this method to be preferable for smaller samples and also for nonuse estimations (Reaves et al., 1999; Mitchell and Carson, 1989; Whitehead et al., 1995). This format, unlike the dichotomous choice or open ended format, appears to avoid starting point bias and respondent's difficulty in selecting a WTP value (Reaves et al., 1999; Mitchell and Carson, 1989). The Coral Reef Survey 2007 incorporates the format used and suggested by Whitehead, that of a 2 part question format for eliciting WTP. To determine how much each participant was Willing-to-Pay (WTP) for the program the survey asked question number 11, the following (See Figure 3 for a full list of all survey questions):

> *"Keeping in mind your income, and other expenses (e.g.*
> *rent/mortgage, food, gas, utilities, and insurance payments)*
> *please answer as truthfully as possible the following questions*
> *(This is not a solicitation of any kind):*
> *Q11- Would you give a one-time donation to the "Adopt-a-Coral"*
> *program in Fiji to restore 10 miles [4 miles] of reef?"*

If the person answered "Yes" to Q-11, they were then asked about the level of likelihood of as well as the motivation behind donation. Individuals were asked to state

"how sure" they were concerning the donation they stated in the WTP question (see Q-13 in the survey in Figure 3). Individuals were allowed to check only one of the four possible boxes provided: "not sure", "somewhat sure", "sure" and "very sure". Asking survey participants about the likelihood of donation has become a somewhat standard question in CVM surveys to assess the validity of the answer. Sometimes the answers below a certain level of sureness are either discarded or weighted (Whitehead et al., 1995).

In addition, those willing to donate were asked "What is the primary motivation behind your donation?" (see Q-14 Figure 3) and given 6 possible choices of which they could only select one: "for future generations", "helping a local community", "giving for personal satisfaction", "helping the environment", "to get a tax deduction" and "other ___".

3.2.5. WTP Models

The basic model for determining WTP was the following[13]:

Equation 1 $\quad$ *Model 1* $WTP = f(k, b, a)$

where WTP for the adopt-a-reef program is a function of *k* captures knowledge and information sources, *b* includes prior behavior and experience effects, and *a* which refers to personal characteristics like income.

Model 1 was run as a linear regression (Model 1_a full sample and Model 1_a limited sample with only donors), a logit regression (Model 1_b), and a tobit regression (Model 1_c) using STATA. Model 1 for the OLS, Logit and Tobit was as follows:

[13] This model builds upon previous CVM models Whitehead et al. 1995 and Mitchell and Carson, 1989.

Equation 2

$$\textit{Model 1}\ \ WTP_{(OLS,\ Logit,\ Tobit)} = \beta_{culture} + \beta_{ocean} + \beta_{movies} + \beta_{recycle} + \beta_{travel} + \beta_{donate} + \beta_{children} + \beta_{white} + \beta_{male} + \beta_{income} + e$$

where each of the variables are defined in the following section, Independent Variables.

3.2.5.1. Dependent Variables

For the OLS model, the dependent variable was the maximum dollar amount the person stated they would be willing to pay for the Fijian conservation program (Q-12 see Figure 3 and 4). If the subject responded "No, not affordable/interested" or "No, other" (Q-11), their WTP values were set at $0.00. The OLS model was run using the full sample (all responses) and for a sub-sample (only those who said "Yes" to Q-11). The dependent variables for the logit and tobit models were binary coded 1 if the person said "Yes" to Q-11 (See Figure 3) and 0 for responses "No, not affordable/interested" or "No, other". The tobit model limit was set to 0 (censored at zero).

The three different models (OLS, logit, tobit) all estimate different types of relationships. These different relationships can be described as follows. For the OLS, the dependent variable is amount in dollars and continuous thus regression analysis is appropriate when the data is distributed normally. The data however does not follow a linear relationship, at least not for the entire data set suggesting the results from the OLS might be biased inconsistent estimators. This means the coefficients are not reliable and likely biased. A large number of WTP responses are clustered at the zero. When the dependent variables are categorical or binary, the logit or tobit models are more appropriate. They take into account the non-linear distribution of the data. The Tobit can

take into account the large number of observations near the zero by censoring the data at zero.

The difference between the models with the full sample and those with the subsample of those expressive a WTP>0 is an important one. The former allows the models to describe the amount contributions, while the latter allows the models to describe the amount of contributions *conditional upon already being a contributor*. It is an important distinction, predicting the contributions among the population and just among those who are contributors, because these groups of individuals differ.

Another variation of Model 1 was run, Model 1_d and Model 1_e, to include the subjects' stated likelihood of donation as part of a certainty test commonly seen in CVM studies (Whitehead and Cherry, 2007). Following Q12 where individuals were asked to state their maximum WTP, the survey asked respondents to state how sure they would be to donate said amount. In many CVM studies today this is done to identify the more likely responses, dropping those that may be less reliable, since WTP models assume stable preferences. If individuals are not sure of their choice (due to lack of knowledge of the good or other reasons), then their answer is likely to be inaccurate. So to create conservative estimates models with and without "sure" WTP estimates were run.

3.2.5.2. Independent Variables

The variables used to capture knowledge/information sources (*k*) include cultural and movie experience (Table 4). These variables represent total number of cultural activities attended or movies seen. The higher the number for either variable, the more types experienced per category. Ocean activity, recycling, international travel

experience, and previous donation variables are used to explain behavior and experience (*b*) related to coral reefs. The last category representative of personal characteristics (*a*) including demographic variables race, household income, number of household children living in home (<18 years of age), and gender.

The following table includes definitions and units for each of the dependent variables:

Table 4. Independent variables categories and descriptions including unit and survey question number.

Independent Variables	Name	Definition	Numeric Unit(s)	Survey Question
Knowledge and Information Sources	Culture Experience	Total number of selected culture experience categories	0-9	Q-8
	Movies	Total number of selected movies viewed	0-6	Q-1
Behavior and Experience	Ocean Activity Experience	Total number of selected ocean-related activities experienced	0-8	Q-6
	Recycle	Total number of types of materials recycled	0-7	Q-5
	Travel Outside US	Experience traveling outside the US	1=yes 0= no	Q-22
	Previous Monetary Donation	Monetary donation in the previous year to a non-profit	1=yes 0= no	Q-17a
Personal Characteristics	Household Children (<18yrs)	Total of household children living in home		Q-28
	Race	White or Non-White (African American, Hispanic, Asian, Native American, Other)	1=White 0=Other	Q-32
	Male	Respondent is male	1=Male 0=Female	Q-25
	Household Income ($10,000)	Total estimated household income for 2007	10,000$	Q-29

The independent variables include binary coded variables like previous donation behavior (where 1 is individuals who gave a monetary donation to a non-profit in the year 2007), travel experience (traveled outside the US equals 1), race (1 white, 0 all other races), and male (1 male and 0 female). The variable on movie experience captures the number of selected movies the participant stated they had viewed. For example, if a person got a 1 in movie experience that would mean that of the questions on movies (*Jaws, Finding Nemo, The Lion King, March of the Penguins, Happy Feet and Jurassic Park*) the person said yes to exactly one of these. The variables on TV experience (*Nova, Survivor, Planet Earth, Live Earth Concert, Shark Week, and Meerkat Manor*), cultural experience (aquarium, museum, lecture, etc.), recycle (appliances, batteries, cans, etc.), and ocean activity experience (swimming, sea fishing, boating, snorkeling, scuba diving, etc.)[14] are coded similarly. The variable for income represents the midpoint for the income category and was measured in $10,000's.[15] Mitchell and Carson (1989) and Samnlieve et al. (2006) both used categories for income like the format used in this survey. The model also includes a variable for the number of children present in the household.

[14] For a full list of all activities see Appendix on descriptive data
[15] Income was a categorical variable converted to a midpoint amount

3.3. Results

3.3.1. Descriptive Data Summary

More than half of the respondents are male, and households had on average less than 1 child living in the home. Over 90% state they had traveled outside the US and donated to at least one non-profit. The mean income was $84,000, and over 80% of the sample is Caucasian/White (the sample design above had oversampled Hispanics, Low Income and African American households). On average, respondents had seen approximately 3 of the 6 movies in the survey, 3 of the 7 kinds of recycling, 3 of the 7 ocean activities, and participated in close to 4 of the 9 cultural events. A complete summary of descriptive statistics can be seen in Table 5.

Table 5. Summary descriptive statistics.

Independent Variables		**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Knowledge and Information Sources	Culture Experience	247	3.611	3.143	0	9
	Movies	247	3.004	2.338	0	6
Behavior and Experience	Ocean Activity Experience	247	2.955	1.883	0	7
	Recycle	247	3.972	1.941	0	7
	Travel Outside US	240	0.908	0.289	0	1
	Previous Monetary Donation	238	0.929	0.258	0	1
Personal Characteristics	Household Children (<18yrs)	236	0.458	0.867	0	5
	Race	235	0.783	0.413	0	1
	Gender	238	0.433	0.497	0	1
	Household Income ($10,000)	206	84.257	69.614	25	400

3.3.2. Knowledge and Information Sources (k)

Of the possible cultural activities attended in 2007, planetariums were visited the least (18.1%) compared to movies with the highest percentage at 85.9% (Figure 5). Overall the data shows individuals appear to be attending many cultural activities; there are larger percentages of "yes" responses for each category of cultural events compared to "no" answers. On average, subjects had experienced 3 of the 9 possible cultural activities (Table 6). Within each category attendance is high but when looking at total experienced by individuals across categories the total 'culturalness' was 3 out of a possible total 9.

Some of these figures were compared and some found to be similar to values of previous estimates of percentages of individuals attending/participating in cultural activities. The Cultural Policy and Arts National Data Archives from Princeton University found through their survey 63.9% of the sample had visited a live performing arts event somewhat close to the 70.2% found in this sample. Percentages may differ if individuals perceived only "live" performances in the Princeton Survey versus all performances in the Coral Reefs Survey. For movies, having attended the movies at least once in the past 12 months the Princeton data found 73.7% of their sample (1,500) had gone to movies; the percentage of sample for this study which had attended movies was higher at 85.9%.

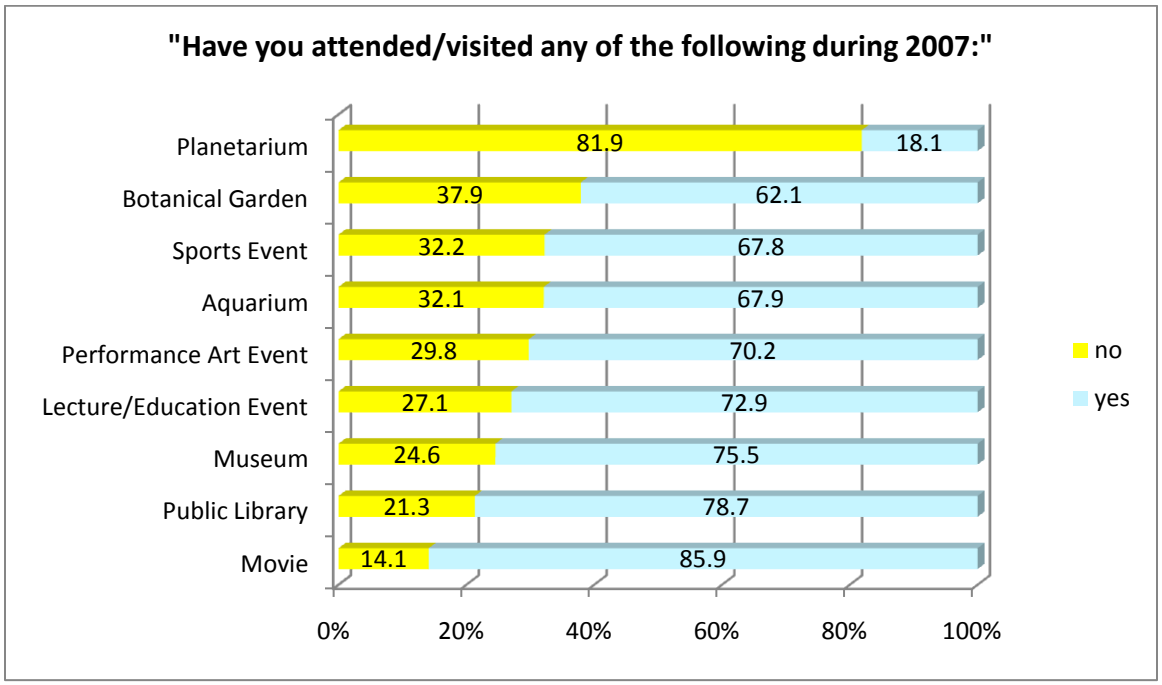


Figure 5. Distribution of responses of "yes" and "no" in percentage by type of cultural event.

When looking at movies seen by participants, newer movies had lower percentage viewed than older ones (Figure 6). Movies like *Jaws* (1975) and *Jurassic Park* (1993) had the highest percentage of viewers with almost 90% and 86% respectively answering "yes". Those movies released after 2003 such as *Happy Feet* (2006) and *March of the Penguins* (2005) were experienced the least. Regardless of type of movie (animation, fiction, documentary) older movies were known more, and on average individuals had seen half of possible choices (Table 5).

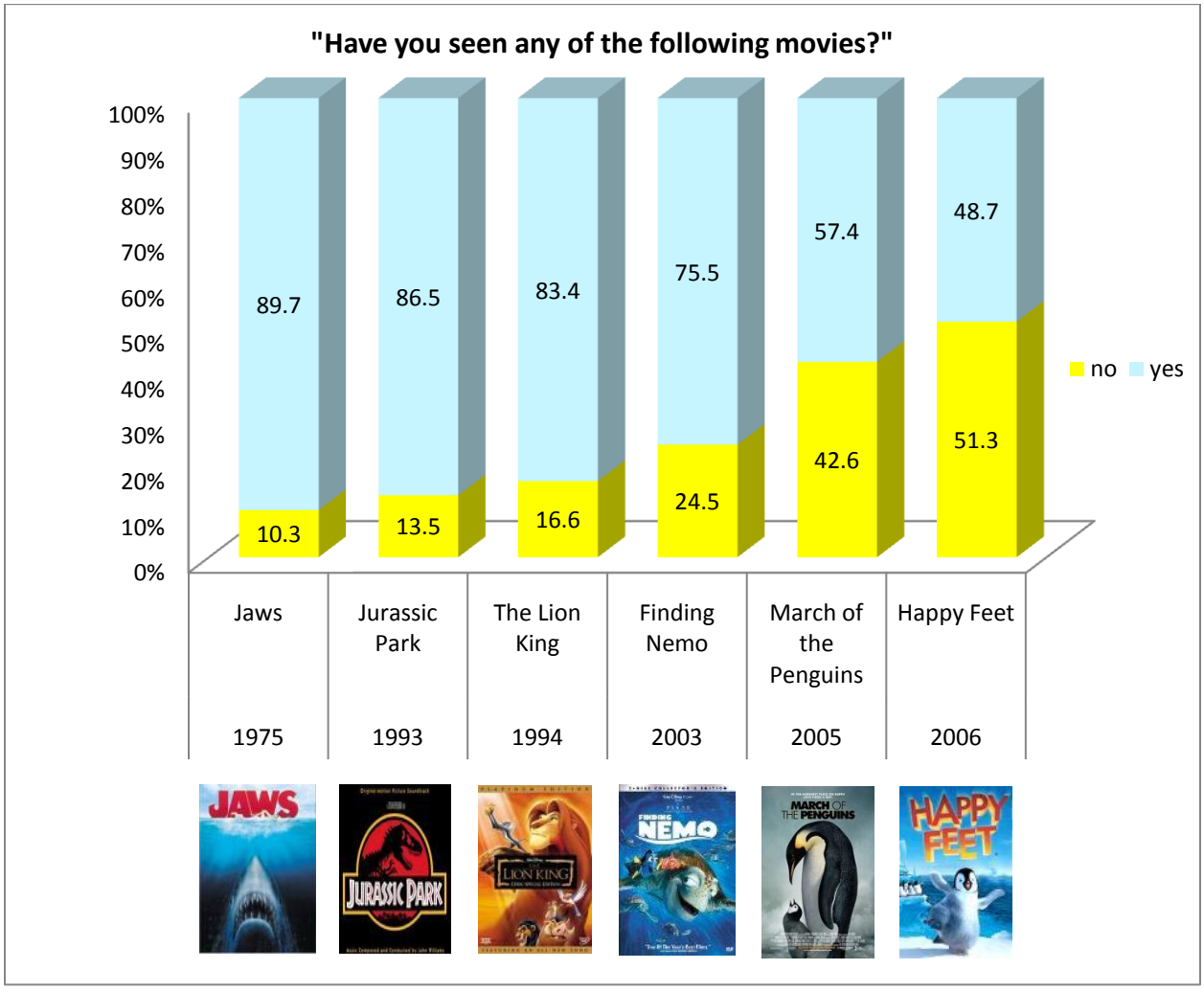


Figure 6. Distribution of responses of "yes" and "no" in percentage by type of movie ordered chronologically from oldest to newest release date.

3.3.3. Behavior and Experience (*b*)

Of the *ocean activities*, scuba diving is experienced the least with only 17.3% (Figure 7). Interestingly enough, although the sample has low scuba diving experience, snorkeling rated high. The data show that "swimming in the ocean" is the most popular activity with almost 75% of participants answering "yes, participated in this activity" in the past X years. Boating, snorkeling and sea fishing also had been experienced more than activities like ecotourism and coral reef viewing. On average, the sample had participated in 3 of the possible 7 options provided (not including "None of the Above").

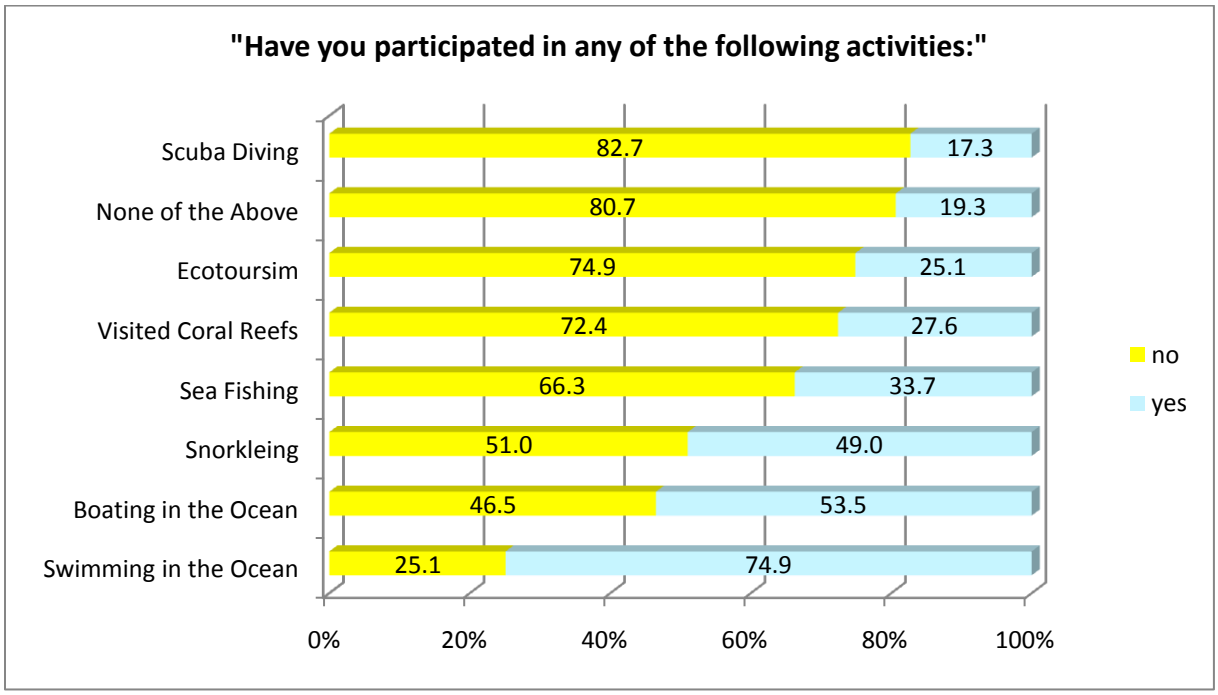


Figure 7. Percentage of previous ocean experience by ocean activity type.

Other possible behaviors/experiences of interest and included in the models are *recycling*, *international travel* and *previous monetary donations*. The most commonly recycled material is paper with 86% whereas appliances are recycled the least at 28% (Figure 8). The mean of *recycling* (counting the total types recycled) for individuals was about 4 of the 7 materials. The data show a higher percentage of travel outside the US; more than 91% of the sample stated they had traveled outside the US (Table 6).

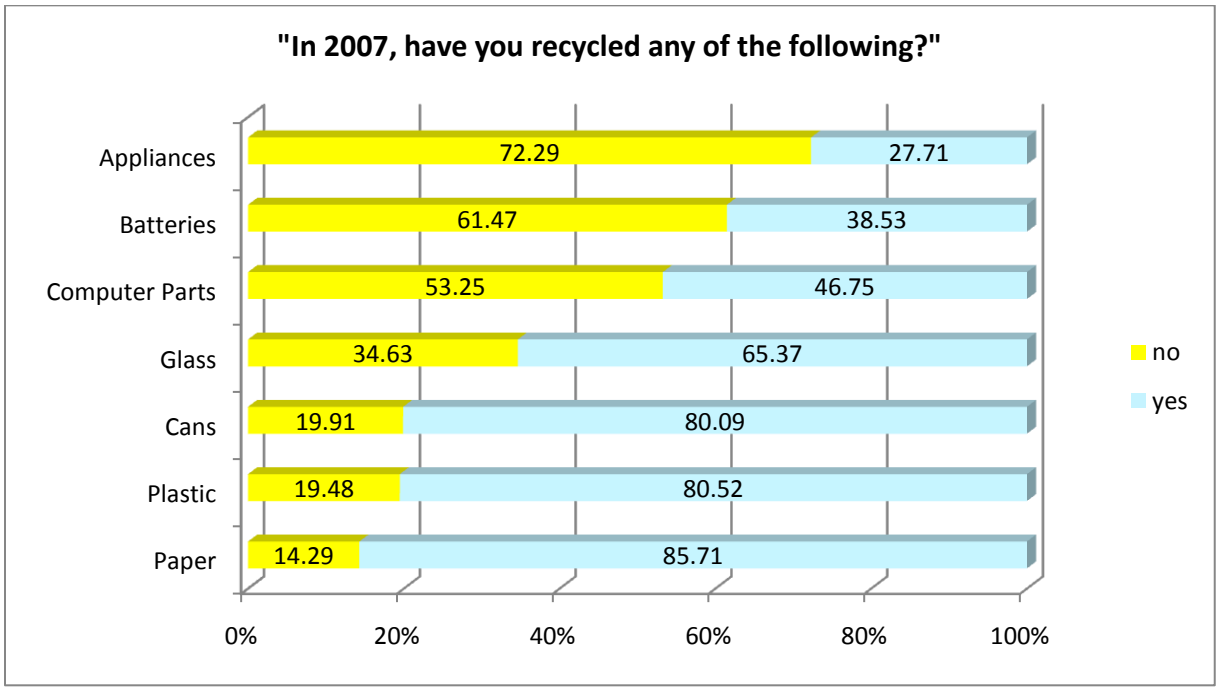


Figure 8. Percent of participants who recycled in 2007 by type of material recycled.

Table 6. Percent of sample with international travel experience.

"Have you ever traveled outside the US?"	Freq.	Percent	Cum.
no	22	9.17	9.17
yes	218	90.83	100
Total	240	100	

The survey included several questions concerning *previous donation experience*. First individuals were asked if they had contributed money towards a non-profit (non-government or charitable group) in 2007. Almost the entire sample has monetary donation experience; 93% of the participants stated they had donated to a non-profit in 2007 (Table 7). Secondly, for those who had donated previously, the survey asked them to state type of organization that received the donation. The most common types of organizations receiving donations in 2007 are religious (49%), children (46%) and community (45%). Political, disaster relief and environmental organizations are least selected types, with 13%, 14% and 25% respectively (Figure 9).

Table 7. Percent of participants who stated had given a monetary donation to a non-profit (yes or no) during the year of 2007.

"For the year 2007, have you given a monetary donation to a non-profit organization (non-government or charitable group)	**no**	**yes**
Percent response	7.14	92.86

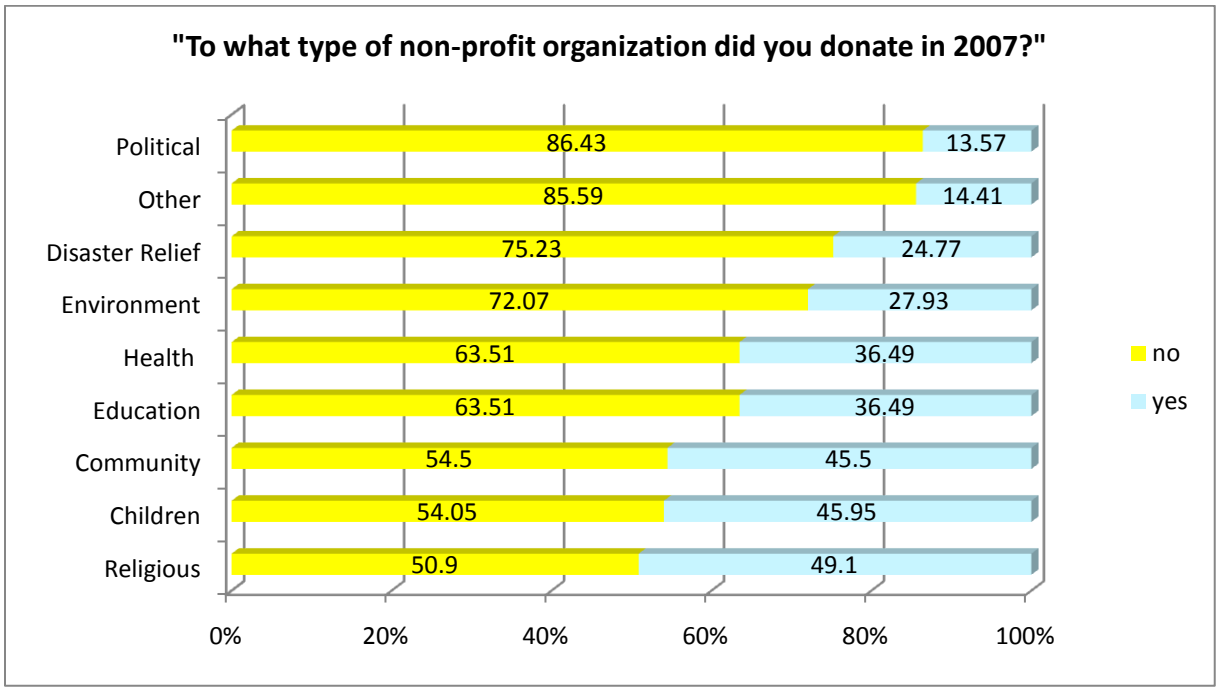


Figure 9. Percentage of responses by donation group.

3.3.4. Personal Characteristics (*a*)

Several variables fell under the *Personal Characteristics* category. Households who participated in the survey tended to have very few to no children (<18 years) living in the home. More than 70% of the sample has zero children living in the household (72%) and those with children the largest percentage was 1 child households (Table 8).

Table 8. Number of household children living in the home at the time of the survey.

"How many children (<18yrs) are currently living in your house?"	Freq.	Percent	Cum.
0	170	72.03	72.03
1	36	15.25	87.29
2	22	9.32	96.61
3	5	2.12	98.73
4	2	0.85	99.58
5	1	0.42	100
Total	236	100	

When looking at the distribution of the sample by race, 78% of individuals identified themselves as White/Caucasian, 16% as Black/African American and 2% as Hispanic/Latino (Table 9). Even with the oversampling of Hispanics and Black households[16], there were a small number of survey responses for these groups.

[16] See Methods section sampling design details

Table 9. Distribution of sample by race.

"Would you share with us your race"	Freq.	Percent	Cum.
African America/Black	38	16.17	16.17
Asian	2	0.85	17.02
Caucasian/ White	184	78.3	95.32
Hispanic/Latino	5	2.13	97.45
Native American	3	1.28	98.72
other	3	1.28	100
Total	235	100	

The sample is comprised of more female than male respondents. Close to 57% of the respondents were females (Table 10).

Table 10. Distribution of respondents by gender.

"What is your gender?"	Freq.	Percent	Cum.
Female	135	56.72	56.72
Male	103	43.28	100
Total	238	100	

The mean annual household income for 2007 for the sample is $84,000, with a maximum of $400,000 and a minimum of $25,000 (Table 5). The largest income category was $95-125,000 with 16% of the sample (Table 11 and Figure 10).

Table 11. Distribution of sample by income groups and selection of midpoint for variable coding.

"Please mark the category that best describes your estimated total 2007 household income"	Original survey category codes				Variables for analysis inc10000		
Income Range	Code	Freq.	Percent	Cum.	Recoded	Percent	Cum.
Under 25k	1	12	5.5	5.5	25	5.83	5.83
25<35k	2	15	6.88	12.39	30	7.28	13.11
35<45k	3	18	8.26	20.64	40	8.74	21.84
45<55k	4	14	6.42	27.06	50	6.8	28.64
55<65k	5	20	9.17	36.24	60	9.71	38.35
65<75k	6	22	10.09	46.33	70	10.68	49.03
75<85k	7	14	6.42	52.75	80	6.8	55.83
85<95k	8	12	5.5	58.26	90	5.83	61.65
95<125k	10	35	16.06	74.31	110	16.99	78.64
125<150k	11	16	7.34	81.65	137.5	7.77	86.41
150<200k	12	17	7.8	89.45	175	8.25	94.66
200<300k	13	8	3.67	93.12	250	3.88	98.54
300<400k	14	1	0.46	93.58	350	0.49	99.03
400k or Greater	15	2	0.92	94.5	400	0.97	100
Do Not Know	16	12	5.5	100	.c	-	-
Total		218	100			206	100

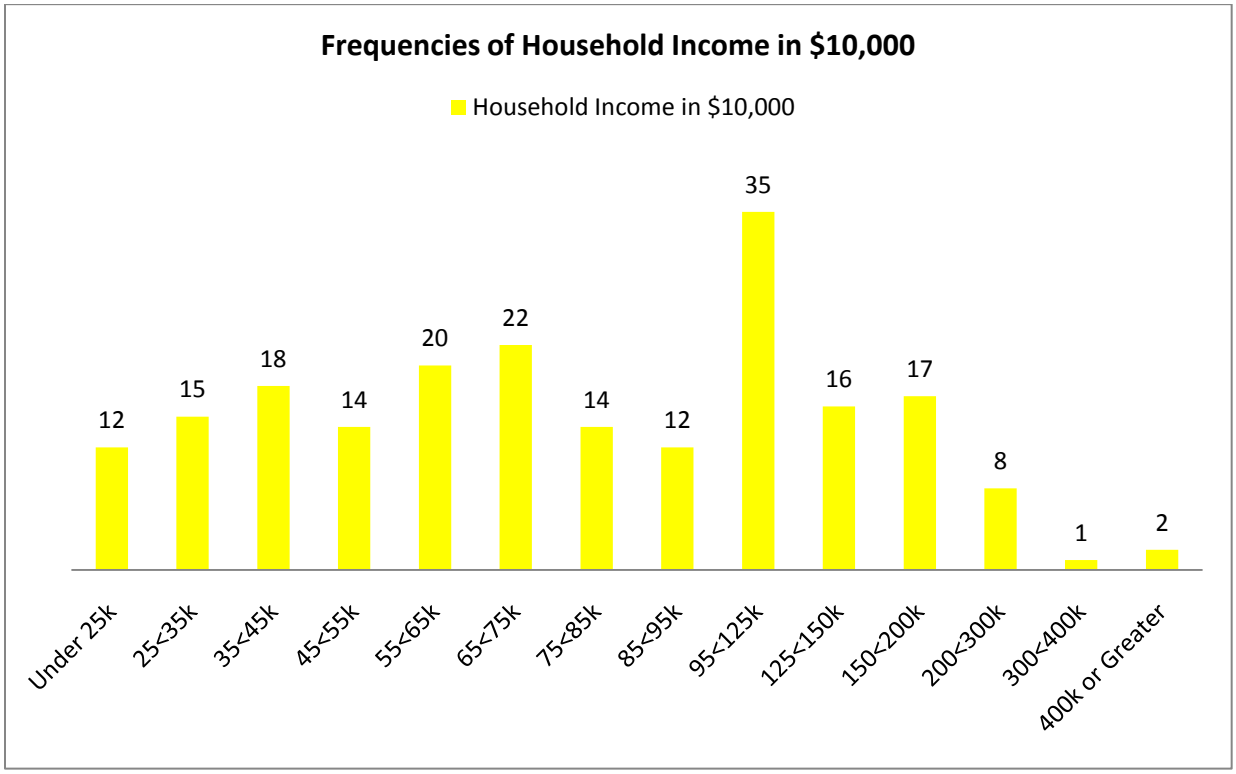


Figure 10. Household income frequencies by income group.

3.3.5. WTP for Fijian Coral Reef

The mean WTP is $13.9 for the group as a whole (for all survey responses) and $32.5 when only considering WTP for donors (those who stated yes to giving a donation). The reliability of the WTP estimate will depend on how close this figure relates to a "true" value, which is difficult to test with CVM data since the purpose of the method is to get non-market prices. One test to assess reliability is to determine the degree of uncertainty in the respondent's answers. Previous studies have suggested that those answers stated with high levels of certainty (7 or 8 out of a 10 point scale) do not significantly differ from real answers (Champ and Bishop, 2001; Poe et al., 2002; Vossler et al., 2003).

Different approaches exist to take into account the level of certainty of the WTP response to minimize and reduce hypothetical bias or "Yea-Saying' effects (Samnaliev et. al, 2006). There is no agreed approach or "best" approach (Samnalieve et. al, 2006). Usually CVM surveys add a question immediately after eliciting WTP; this is usually in the form of a scale were the person is asked their level of certainty about the stated WTP figure. These scales tend to run from 1-10 where 10 is very sure, and researchers tend to view are reliable only responses equal to 8 or higher. Using a scale to asses certainty tends to be the more popular approach although others[17] have been used (Samnalieve et. al, 2006; Wang, 1997; Welsh and Poe, 1998; Ready et al., 1999; Ready et al., 2001).

Some studies then take all 'not sure' responses and either treat the observation as not valid (dropping them from the sample), recode as $0.00 (because not reliable), or

[17] Several ways to expresses uncertainty according to Samnlieve et. al (2006) include multiple-bounded questions (Welsch and Poe, 1998), random valuation model (Wang, 1997), uncertainty scales (Champ et. al, 1997; Ekstrand and Loomis, 1997), polychotomos choice (Ready and Navrud, 1999) and the "Do Not Know" NOAA approach.

recode into “do not know” or missing responses (Alberini et. al, 2003; Carson et. al, 1994; Whitehead and Cherry, 2007; Samnaliev et. al, 2006; Champ et. al, 1997). Carson et al. (1994) treated the “Not Sure” responses as missing and suggested if these respondent were forced to choose they would likely state no (not WTP). Champ et al. (2003) indicated “not sure” answers were reflective of the person being unsure based on their income, or faith in the program being offered in the scenario. Wang (1997) found the “Do not know” (Not Sure) as the point of indifference to the offered bid in dichotomous choice WTP questions; for if the price were to go up, those who responded as “Yes” would likely change to “Not Sure/Do Not Know” and this responses with “Not Sure” would answer “No”. Wang went on to include the uncertain answers in the study’s multinomial logit. Finally Ekstrand and Loomis (1997) suggested the scale of uncertainty works for “yes” answers but not so well for “no” responses where results for the logit model showed reduced Goodness-of-Fit. Recent studies have argued over how these tests improve reliability and decrease bias. Shaikh, Sun and Kooten (2007) tested five approaches of certainty in their study. Their results suggest the inclusion of a certainty approach can in some cases improve the goodness of fit of the model, but has been found sometimes to increase the variance (Shaikh et. al, 2007). Probably the most useful way to calibrate WTP answers would be to compare stated answered about their preferences with actual behavior, but this option is not yet possible with this coral reef data.

As in previous CVM studies (Carson et al., 1994; Champ et al., 1997), this survey included a question asking participants how sure they were of donating the stated amount in the WTP question (Q12). If the level of “sureness” is taken into account (see Table 12

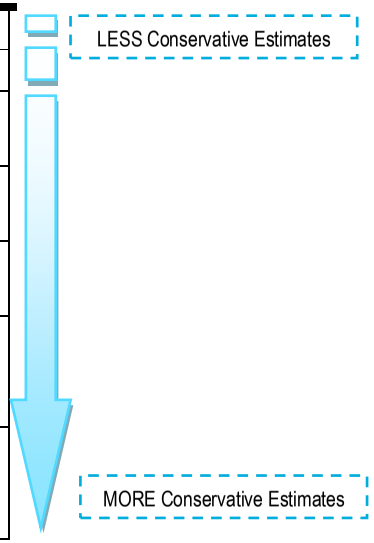
with all distribution WTP numbers for distribution of sureness) and those individuals who stated "not sure" or "somewhat sure" are considered as non-donors and given a value of $0.0, then the mean WTP changes to $8.00. If the same concept is applied in an even stricter manner, where those who stated "not sure" "somewhat sure" and "sure" are considered as non-donors and only those who answered "very sure" are taken into account, then the mean WTP drops even further to $1.47. The Table (Table 12) presents WTP estimates both with and without controlling for uncertainty in WTP response.

The most conservative estimate, $0.18, included adjustments for non-response bias[18] by including these households into the calculations (as $0.00 donors) and for hypothetical bias by adjusting for "sureness" levels ("not sure", "somewhat sure" and "sure" as $0.00). In the CVM literature usually two extremes are taken when working with nonresponse bias, either this group is treated as having equal preferences as those who responded (usually done when information is gathered on this group) or given a value of zero (assumed they are not WTP) (Bostedt and Boman, 1996). Because this study was not able to conduct follow-up surveys to those who did not respond, a conservative estimate was presented where non-respondents were assumed to have zero value (albeit this is likely not true for all non-respondents). Although slightly less conservative, the estimate of $0.98 WTP included both adjustments for hypothetical bias ("not sure" and "somewhat sure" as $0.00) and for non-response bias (Table 12).

[18] Non-response bias refers to the bias in the WTP estimates by not taking into account the large number of individuals whom did not respond to the survey.

Table 12. WTP averages including or adjusting for level of "sureness" of donation and/or non-response bias starting with the less strict estimates ending with the most conservative estimates of WTP.

Adjustment	Group	N	Mean WTP
NO Adjustment	Only Donors	104	$ 32.5
	All Respondents (Donors and Non-Donors)	244	$ 13.9
Adjusting for Likelihood of Donation	All Respondents but those with "Not Sure" or "Somewhat Sure" set at $0.00	244	$ 8.02
	All Respondents but those with "Not Sure", "Somewhat Sure" or "Sure" set at $0.00	244	$ 1.48
Adjusting for Non-Response	All Surveys (including non-respondents $0.00)	2000	$ 1.69
	All Surveys (including non-respondents $0.00, Not Sure" or "Somewhat Sure" set at $0.00)	2000	$ 0.98
	All Surveys (including non-respondents $0.00, "Not Sure", "Somewhat Sure" or "Sure" set at $0.00)	2000	$ 0.18



When not addressed, hypothetical bias-when hypothetical WTP differs from real WTP-can lead to upward biased estimators of WTP and those with passive nonuse value should take estimations as upper bound figures of value (Whitehead and Cherry, 2007; Cummings et al., 1995). Addressing hypothetical bias can be done before or after survey implementation (Whitehead and Cherry, 2007). During the survey design stage, questions are pretested to decrease the likelihood of individuals giving a false answer based on unclear WTP scenario or because individuals do not constrain their answer to their income thereby stating unrealistic WTP amounts. Also, surveys include reminders to the respondents to provide truthful answers ('cheap-talk' approach) to ensure valid WTP responses (Loomis et al., 1996; Cummings and Taylor, 1999; Lusk, 2003). In cases where the respondents have less knowledge about the good in question, Lusk (2003) found 'cheap-talk' mitigated hypothetical bias. Reminders are usually about income constraints, actual behavior, and truthful answers. Both approaches, careful design and 'cheap-talk' format, were included in the survey to reduce the likelihood of hypothetical bias. For 'cheap-talk' the survey reminded individuals about income and also about the consequences of lies on results as a short paragraph prior to the WTP question which tends to be the general format. They survey's extensive pre-testing stage and expert review hopefully also captured issues around scenario clarity, so as to produce the fewest number of answers due to differing understandings of the information. Hypothetical bias can also be addressed via certainty scales, also included in this study, discussed in the previous section.

When looking at Table 13, the number of people with positive WTP amounts is small. More individuals have smaller WTP, such as $10 and $25, than $200. The data

show only 1 out of 244 households would donate $200 with a “sure” to “very sure” statement about the likelihood of their donation (Table 5). Over 50% of the sample would donate nothing ($0.00) towards the conservation program in Fiji. Close to 12% of the households in the study stated they would be willing to pay a maximum of $25, 7% would give $50 and 6% would donate $10.

Table 13. Distribution of maximum WTP for Atlanta households by amount donated.

WTP $$$

Max WTP	Frequency	Percent
$ 0	141	57.79
$ 1	4	1.64
$ 5	8	3.28
$ 10	14	5.74
$ 15	5	2.05
$ 20	15	6.15
$ 25	29	11.89
$ 50	16	6.56
$ 100	11	4.51
$ 200	1	0.41
Total	244	100

Donors had differing motivations behind their WTP. ‘Helping the environment’ was the most popular response (60%) as the primary motivation for donating towards the Fijian reef conservation program (Table 14). The second highest motivational response of almost 30%, was to ensure future generations would have Fijian coral reefs.

Table 14. Frequencies for types of motivations behind stated WTP donation.

Primary Motivation for Fiji Coral Reef conservation Program

Motivation	Frequency	Percent
Future Generations	29	28.2
Help the Local Community	4	3.9
Giving for Personal Satisfaction	6	5.8
To Help the Environment	61	59.2
Tax Deduction	1	1.0
other	2	1.9
Total	103	100

Findings suggest a larger percentage of responses across all categories to fall within the $0.00 WTP bid amount (Table 15). Of those who did say that they expressed a willingness to donate money, WTP was higher for those with travel experience when compared to those with none. When looking at the largest group of donors, the $25.00 donation, there are more women who donate than men; the ratio women to men is almost five to 1.

Table 15. Frequencies of WTP responses by category.

	Traveled Outside the US		Gender		Average Household income for 2007			"How sure are you to donate the $ amount you stated?"				Motivation for Donation					
WTP $	no	yes	Women	Men	< $55,000	$55,000-$85,000	> $85,000	not sure	somewhat sure	sure	very sure	Future Generations	Help Local Community	Personal Satisfaction	Help the Environment	Tax Deduction	Other
$ 0	12	124	70	64	41	30	52	1	0	0	1	1	1	0	0	0	0
$ 1	3	1	3	1	2	1	0	0	3	0	1	2	0	0	2	0	0
$ 5	1	7	5	3	2	2	3	1	3	1	3	1	1	1	4	0	0
$ 10	1	13	9	5	4	4	4	0	6	8	0	3	0	0	10	0	0
$ 15	1	4	2	3	0	3	2	1	3	1	0	1	0	0	3	0	1
$ 20	1	14	9	6	2	2	11	0	8	6	1	3	1	0	11	0	0
$ 25	1	28	24	5	6	11	12	1	10	11	6	8	0	1	19	1	0
$ 50	1	15	5	11	1	2	10	0	7	6	3	7	1	3	5	0	0
$ 100	0	10	5	5	0	1	8	0	5	6	0	3	0	1	6	0	1
$ 200	0	1	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0
Total	21	217	133	103	58	56	103	4	45	40	15	29	4	6	61	1	2
$	$128	$3156	$1878	$1406	$292	$611	$2105	$45	$1383	$1595	$336	$962	$75	$280	$1912	$25	$115

3.3.6. Influential Variables on WTP

There appear to be several factors significantly related to WTP for the Fijian coral reef conservation program. Both OLS models (full sample and subsample of only donors) found Cultural Experience significant and positive (Table 16, Model 1_a and Model 1_a Subsample) on WTP suggesting for every additional cultural experience[19] WTP increases by \$1.27 ($p<0.05$) and \$1.77 ($p<0.10$), respectively. When the model takes into account the level of sureness of donation by the participant, Model 1_e and 1_f were not significant. The number of ocean activities previously done by individuals appears to have some effect on the likelihood of donating even though no impact on the amount itself. The logit and Tobit models find the ocean experience coefficient significantly related to donating towards the coral reef program (Table 16). Recycling behavior was the only variable significant for all models except Model 1_e (Table 16). These models all find WTP positively related to recycling, and as individuals recycle additional types of materials WTP increases significantly by \$2.68 ($p<0.05$) for OLS Full Sample model (Model 1_a) and close to \$4.10 ($p<0.10$) for the Donor-Only sample (Model 1_b). The binary models (logit and Tobit) also show higher likelihood of stating "yes would donate towards the Fiji Adopt-a-Reef Program" as they increased recycling (Table 16).

Findings indicate people who donated towards non-profits in the previous year were more likely to express a willingness to donate for the program in Fiji by \$10 ($p<0.01$), compared to individuals who stated no prior year charitable monetary contribution. Similarly, the logit and Tobit models also indicate a significant relationship

[19] This assumes that all experiences have the same effect on WTP, have the same weight, and are interchangeable-this is an assumption for purposes of this study.

between donation probabilities with prior donation experience. Being female increases the chances of donating to the Fiji program compared to men (logit Model 1_c); on average women donate $2 more than men, and were 17% more likely than men to donate.[20] For every additional $10,000 increase in household income, WTP increases by $44.0, holding all other values constant. Or stated differently, if an individual's increases their salary from $45,000 to $55,000 they are then likely to donate an additional $44.0 to the amount they would donate at $45,000. Whitehead (2005) uses an own-price variable (instrumental variable) and joint estimated model to account for endogenous effects on the WTP model. In many cases these options are not always possible and in many studies omitted (Whitehead, 2005) due to the lack of appropriate proxies for own-price.

[20] Prchange results see Appendix

Table 16. Results for Model 1 OLS full sample, OLS limited sample, Logit and Tobit for the "Adopt-a-Reef" program in Fiji.

	OLS Donors Only	OLS Full Sample	OLS Sure and Very Sure	OLS Very Sure	Tobit	Logit
Dependent Variable	WTP measured as $ (interval)				Censored at 0 where WTP($)	WTP where 1 = would donate to program, and 0 = no would not donate (both "no" answers)
	Model 1_b	**Model 1_a**	**Model 1_e**	**Model 1_f**	**Model 1_d**	**Model 1_c**
Cultural Experience	*1.78(1.68)	**1.27(2.15)	0.68(1.23)	0.21(1.02)	1.98(1.55)	0.05(0.84)
Movies Experience	0.6(0.45)	0.38(0.58)	**1.45(2.02)	**0.56(2.18)	1.04(0.61)	0.02(0.26)
Ocean Experience	-2.31(-1.24)	1.36(1.42)	-0.22(-0.23)	0.03(0.08)	**5.15(2.36)	***0.34(3.35)
Recycling Behavior	*4.11(1.83)	**2.69(2.18)	0.85(0.98)	*-0.53(-1.69)	***5.51(2.67)	*0.17(1.89)
Travel Outside US	11.08(1.43)	2.61(0.7)	0.26(0.05)	0.38(0.2)	-2.61(-0.21)	-0.47(-0.78)
Previous Monetary Donation Experience	10.83(1.38)	***9.55(2.7)	4.36(0.75)	1.14(0.54)	**34.95(2.01)	*1.74(1.83)
Household Children	-4.75(-1.31)	-2.45(-1.51)	*-2.29(-1.24)	-0.19(-0.28)	-4.93(-1.11)	-0.16(-0.75)
White	-8.09(-0.83)	-7.33(-1.41)	0.54(0.13)	2.05(1.35)	-13.81(-1.36)	-0.55(-1.22)
Male	9.08(1.34)	-2.02(-0.59)	-4.67(-1.5)	*-2.04(-1.82)	-10.99(-1.47)	**-0.73(-2.18)
Income ($10,000)	0.06(1.34)	*0.05(1.92)	0.02(0.61)	0.01(0.63)	0.09(1.4)	0.01(0.77)
Constant	-8.63(-0.8)	-14.2(-2.75)	-5.28(0.72)	-1.26(-0.48)	-76.85(-3.61)	-2.7(-2.62)
Number of obs	88	200	200	200	200	197
F(10, 189)	2.18	2.73	1.32	1.16		
Prob > F	0.0274	0.0037	0.2263	0.3179		
R-squared	0.1702	0.1222	0.0725	0.0764		
Root MSE	29.749	24.585	21.007	7.5619		
LR chi2(10)					32.18	
Wald chi2(10)						19.25
Prob > chi2					4E-04	0.0372
Pseudo R2					0.03	0.1131

NOTE: coefficients are robust and t-stats within "(t-stat)", * p<0.10, ** p<0.05, and *** p<0.01.

3.4. Discussion

On average, individuals from the Atlanta "Coral Reef Survey 2007" sample had an average Willingness-to-Pay (WTP) of $13.9 for the conservation of Fijian reefs, and with more surety a WTP of $1.47. If non-respondents were incorporated into WTP estimates, an even more conservative measure emerged at $0.18 per household. This measure even at its most conservative implies some positive WTP value by the Atlanta sample surveyed-a group very distant from Fijian reefs. Although little empirical work exists on valuation measure for reefs of non-users and groups distant to reefs, the results from this study appear plausible; $0.18 seems a realistic number for a household to pay on average. Museums, aquariums and botanical gardens have donation machines of 25cents such as for the conservation of rainforests. According to the US Census, the Metro Atlanta Area has 5,376,285 residents. If 10% of this group donated $0.18 for reef conservation, the Fijian nonprofit could potentially collect close to $10,000 for conservation.

Hypothetical bias in this study was mitigated by using approaches from the literature found to be beneficial including certainty scale, 'cheap-talk' and careful survey design. Whitehead and Cherry (2007) find pre ('cheap-talk' and survey design) and post ante (certainty level to calibrate WTP) approaches to be complementary, and lead to more valid WTP answers. A certainty scale, found to be more effective in some studies than 'cheap-talk' (Champ et al., 2005) was included in the survey and participants were asked to state their level of confidence in their WTP statement. Those individuals with lower scoring certainty levels "not sure" were treated as unreliable and thus considered as $0 WTP estimates. Those individuals with answers "somewhat" "sure" and "very sure"

were assumed to be valid. Even though this study attempted to decrease the likelihood of hypothetical bias before data collection, the only way to be sure is to also carry out ex-post tests as suggested by Whitehead and Cherry (2007). The researcher can do further qualitative research such as interviews to ascertain the validity of WTP answers from a select subsample. This study was limited by funds and could not carry out follow-up interviews. However, this is a future task of this work. Recent CVM studies have also used statistical bias functions to calibrate hypothetical bias (Johannesson et al., 1999; Whitehead and Cherry, 2007); these have been found to not be useful for all CVM research since they tend to require information about actual WTP and the functions are specific to the study (Mansfield, 1998; Whitehead and Cherry, 2007). Estimates from this study are likely to be more reliable at the more conservative spectrum of values of WTP of respondents for Fijian reef conservation.

All of the valuation studies on coral reefs have been done in areas where coral reefs are present (Thailand, Bonaire, Jamaica, Hawaii, Australia, Mexico), all producing different valuation estimates (Lozano and Caswell, 2008). To date there do not seem to be any CVM studies of coral reef done in a location with no natural coral reefs. Although coral reef CVM estimates from different studies likely cannot be compared directly with each other due to differing scenarios, it may be of interest to know where the Atlanta sample estimates falls within studies done on site near reefs. The Phi Phi Islands-Thailand study asked 529 participants (400 local and 129 international) their WTP to conserve coral reefs and it averaged around $7.71 (Seenprachawong, 2001). Bonaire study found average WTP at $27.40 for recreational fees (Furst et al., 2000) which again is a far larger figure than the estimates from the Atlanta study. This pattern appears

consistently when compared to other CVM reef studies. Although distance effects could not be tested directly with this study, the findings suggest differences between users and nonusers concerning reef conservation value. A study in Vietnam compared domestic WTP with international visitor's WTP and these figures differed by $0.80, $3.10 versus $3.90 respectively (Khan Nam et al., 2005). Hawaiian households would have a WTP of $10 per year, in part due to closeness of reef. The study looked at WTP for many aspects; in particular non-use values defined around biodiversity and the assumption was that people were WTP for some good or service even if they do not use it (Cesar et al., 2002).

Because of the limited data on valuation measures for distant-to-reef households, it is difficult to compare distribution of donations. However, one study in Mexico with a somewhat similar program description-"coral fund"-had similar bid structure and seemed to mimic results in a few of the bids from the Atlanta study. The study in Mexico asked tourists if they would be willing to pay for reefs to have more protection leading to a healthier reef system (Casey, 2006). This particular study is of interest since its scenario is similar to the Fijian scenario of this study. However, the Mexico study sampled tourists on site near reefs. When looking at the distribution of donations (Table 17), more than 50% of the Atlanta sample would pay $0.00 compared to the Mexico study with only 35% of the individuals would have donated nothing. The reverse pattern shows up when looking at $5.00 bids. A far larger percentage of individuals in the Mexico study (Casey, 2006) compared to the Atlanta study would pay this amount, 21.4% versus 3.3% respectively. Similarly this difference shows up in the $10.00 bid.

Table 17. Frequencies of WTP bid responses by bid amount for the Atlanta Coral Reef Survey 2007 and the reef study in Mexico by Casey (2006).

		Max WTP										
	WTP Bid Amount in Dollars	***$0.00***	***$1.00***	***$5.00***	***$10.00***	***$15.00***	***$20.00***	***$25.00***	***$50.00***	***$100.00***	***$200.00***	Total
Atlanta Study	% of Total	57.8	1.6	3.3	5.7	2.1	6.2	11.9	6.6	4.5	0.4	100.0
Mexico Study	% of Total	35.6		21.4	16.3			13.1	9.2	4.5		100.0

Note: shaded areas were bids not asked in the Mexico study (N=337) but asked in the Atlanta study (N=244). Data for the Mexico study is from Casey (2006).

The studies had similar percentages for WTP values of $25.00, $50.00 and $100.00. The larger differences appear in the lower bids; far more people on site (near reefs in Mexico) would donate in the ranges of $5-$10.

The differences between the Mexico and Atlanta study could indicate several things. First, likely the studies are not comparable in terms of the resource itself and individuals surveyed meaning the differences between the studies is irrelevant. Fiji reefs are far richer than Mexican reefs concerning biodiversity, usually have more visibility and travel to Fiji on average is more expensive for Americans. Tourists visiting reefs may significantly differ in personal characteristics when compared to the Atlanta sample- a unique sample as well since they are not on site. Secondly, there may be bias in this survey instrument itself (see Chapter 3). Third, and probably the hardest possibility to test with the current data (but at the core of why research like the Atlanta valuation study is needed), maybe individuals who live far from the reefs value the reefs the same as those who live close. On average, the Atlanta sample would be WTP $13.9 (least conservative estimate) for Fijian conservation versus the $20.0 WTP figure (also their conservative estimate) from the Mexico study whose sample was comprised of locals and non-locals. Individuals who donate maybe are just donors of environmental issues in general and so likely to donate high regardless of location of issue, since it's the issue itself that matters (environmental conservation).

In the future, the next study would do well to gather CVM data on site in Fiji as well as at geographic intervals between Fiji and Atlanta in order to understand if and how distance effects impacts WTP for the Fijian coral reef program. Users are likely to value highly the good, especially scuba divers, due to the large expense incurred to carry out

this activity. However, since few studies exist comparing samples between reef users/locals and non-reef locals at a distance, it is difficult to say if in fact divers/users would pay more for coral conservation.

3.5. Implications

There are underlying assumptions about what makes people "care" and "care" enough to give a monetary contribution (which is one way to view value of an environmental good). What influences WTP and why does this matter? Programs such as the "Adopt-a-Reef" program in Fiji are looking for innovative ways to expand their support base but also increase the overall value of Fijian reefs. Previous research has failed to include in reef valuation studies a potentially large group of nonusers likely to have some positive contribution to the overall total coral reef value. Generally this group does not use the reef or participate unless on-site such as during a tourist trip or diving/recreational travel. The previous discussion section suggested that there is potential monetary contribution by distant-to-reef groups, such as Atlanta. Practitioners and non-profits may wish to learn what factors lead to a higher likelihood of donating and higher levels of donations to maximize benefits or participation.

The popular assumption about information has been that individuals will care more about a particular issue if they are more informed. Many public policies stand on the information-leads-to-behavior-change assumption and many have been successful. For example, the lead-paint, cancer screening and even drunk driving campaigns. The more information and knowledge the more likely the individual will change his/her

behavior. In fact, there are organizations who focus on informing the public and hope increased knowledge will lead to a change in behavior.

For the past twenty years aquariums have focused on providing the public an experience with an educational component (Falk and Adelman, 2003), specifically hoping a person will "care" more for this resource, place a higher value and alter behavior to conserve said resource. The underlying assumption is that the more information an individual has about the role of oceans-the relationship between marine life and human activities-the more likely a person will "care" about conserving ocean ecosystems. Empirical tests of this assumption are few, and it is unclear as to how information interacts with valuation and behavior (Adelman et al., 2001; Dierking et al., 2006). Just because an individual knows that keeping clean oceans helps fish populations does not mean this person will place value on clean oceans or be active in ocean conservation activities.

Older retired Individuals with middle-high income levels who recycle and have some culture experience seem potential positive WTP donors. This study attempted to test whether WTP was significantly related to information, having more or less exposure to different kinds of sources, and or prior donation experience. The two primary variables defining information were culture and movie experience. These variables are total number of culture activities or movies seen; the higher the number the more the person had experienced. Findings indicated positive a relationship between the number of cultural experience and WTP and movies and WTP. These findings seem to suggest there may be some overall effect concerning the quantity of sources of information with WTP. Experiencing more theatre, educational lectures, aquarium visits, and other similar

activities may lead to higher WTP. The same effect appears when looking at movies and WTP.

There are various possible explanations for these results beginning with the age of participants. The average survey respondent age was 52.8 years; older people tend to be more engaged in culture events. This might explain the effect of "cultureness" on WTP. A more heterogeneous sample may lead to different results. Age might also explain why older movies had been seen more than newer movies. Although the research design specifically includes a variety of movies (animated, documentary, classic), the newer movies were less popular than the older ones such as *Jaws* and *Jurassic Park*.

Previous experience doing activities specific to marine environments, "green" behavior like recycling, past charitable contributions, and/or international travel might also impact WTP. Individuals who have experienced ocean swimming, fishing or diving likely will be assumed to value this resource more. "Green" individuals, defined as those who recycle, had higher WTP than those who do not recycle as much. Travel to other countries increases the chances of exposure to other types of environments which could lead to a more "global" perspective of environmental issues. The study finds stronger evidence for recycling as an influential factor on WTP compared to the other variables ocean experience, travel and previous charitable donation. The data suggest that as individuals recycle more types of materials, increasing overall recycling within the household, WTP values increase significantly. Ocean experience, although with less empirical support, also seems to impact the likelihood of donating. Finally those subjects with previous donations to non-profit organizations were found to significantly lead to higher WTP values.

Previous CVM studies have found income to be positive and significantly related to WTP. This is usually used as a validity check; as income increases so should WTP. A recent study in Environmental Resource Economics conducted a global meta-analysis of specifically CVM studies around nonuse valuation such as biodiversity (Jacobsen and Hanley, 2008). They looked into whether income and WTP were positively related and found only 39% of their studies showed a positive correlation. The Atlanta survey found a significant and positive effect of income on WTP albeit small in magnitude, and this effect was not significant across all models. When non-response and level of sureness of donation are incorporated into the calculation this effect was no longer significant. Jacobson and Hanley (2008) suggested a possible reason for the low number of studies with positive income and WTP relationships might be due in part to the nature of the survey instrument. Many times in CVM surveys income is asked as a range; individuals might report incorrectly leading to inaccurate income variables. They go on to further state one reason for variation in WTP may be due to factors such as institutional settings, environmental attitudes and biodiversity context and income alone does not likely explain increase in WTP as income increases.

A particular interesting result from this study concerns gender, where women had higher WTP values then men. Andreoni, Brown and Rischall (2003) also found significant differences between men and women, single and married, concerning charitable giving. They found that when looking at decisions by married couples, the person allocated the charitable donation task, the decision to the type of charity and amount reflected the preferences of the person. When decisions were made jointly male preferences seemed to dominate. Overall women gave to a larger variety of charities but

giving less to each, where as men gave to fewer types of charities but more generous in terms of amount donated. In addition, married women tended to prefer organization around health and education. Gender WTP results are conflicting. A recent study in the Journal of Ocean and Coastal Management (Svensson, Rodwell and Attrill, 2008) found women donated less than men opposite to results in this thesis research and Andreoni et al. (2003) findings. Svensson et al. (2008) found female WTP equal to $12.46 versus $13.44 for men, however, the effect was not significant. Questions arise as to why the gender difference exists and what might contribute to the gap. Do women care more for coral reef issues then men? A future extension of this research will be to delve further into the factors around gender and WTP potentially by interviewing respondents and or conducting further surveys.

Those who donate towards the conservation of Fijian reefs are not necessarily the same people who donate towards a US reef protection program and vice versa (Table 6). The highest percentage would not donate to either program. There were few people who would donate towards the Fijian program and not towards one similar in the US. However, although there were more responses to donating in the US and not Fiji, suggesting people might care more about local programs, surprisingly 42.6% would donate to both programs.

3.6. Conclusions

As we learn more about the characteristics of those individuals who are interested in coral reef conservation, non-profits such as the Fijian one could target donors more efficiently to maximize monetary support. This study finds cultural experience,

recycling, previous non-profit donation and ocean experience to be likely predictors of interest in WTP for a Fijian conservation program. Findings from this work highlight two important issues rarely discussed in the policy literature: 1-the use of non-market valuation methods to identify stakeholders and 2-the effects of distance on use and non-use value ultimately impacting conservation. Determining the location and type of stakeholders for environmental policy has always been difficult and few solutions to this problem have been suggested.

Currently, practitioners are looking towards the application of market-based tools and have limited understanding of which ones could provide the answers they seek. Market-like solutions generally require information about the value of the good. Assessing the value of a natural resource such as coral reefs is a difficult problem because of the complexity of the system (Costanza et al., 1997). An ecosystem cannot easily be physically divided into parts and each sold separately without collapsing the reef, unlike tradable air pollution quotas which are less ecologically complex. Food chains are not yet all understood and know. Science is still trying to determine if restoration ecology does create all the links needed for a healthy, highly biodiverse productive ecosystem like coral reefs. This is in part why the physical division of reefs is not easily done. However, that being said the establishment of clear property rights as is the goal of many market-like policies can address some of the "commons" characteristics of coral reefs. Previous policies set reef management to be governmental and failed to address the underlying incentives for behaviors leading to the deterioration of reef health. Market-like policies take a different approach than previous command-in-control approaches and try to create behavior change through changes in incentives. These new

policies require some information about the environmental good, like price which is helpful but not required. Much more important is to know who the stakeholders are and allow these to sort themselves so that those with the most value (which could be the "tree-huggers") are able participate in the management of coral reefs. Currently, it is a general assumption that those located near reefs have the most value for them, yet without having measures from the nonusers it is still unclear as to which group has the most value for coral reefs. This is where CVM can help and has played a very small, less 'public' role. Using data about individuals' WTP stakeholders with the most interest (highest WTP) could be identified and potentially found to contribute as much as nonusers affecting the who is included in the decisions about coral reef conservation.

CHAPTER 4. Household Perceptions on Scale and Magnitude of Coral Reef Problems and Donor Group Characteristics

4.1. Environmental Problem Definition and the Public

Environmental problems have temporal and spatial dimensions (Bockstael, 1996; Norton, 2005). Efforts to solve an environmental problem, like coral reef deterioration, might take into account the magnitude (level of severity), causes (source or problem) and impact (consequences/effects of problem). All of these factors can be part of the definition of a problem; in turn the definition bounds the problem and its solution. For example, early efforts to reduce coral bleaching focused on decreasing runoff of local pesticides and chemicals into the ocean.[1] However, as the causes of the problem expanded to include global warming, the efforts to solve the problem no longer were limited to local boundaries but changed to global ones. Coral reef conservation efforts usually have implicit and or explicit views embedded in the definition of the problem, which directs efforts and target groups. Reef efforts are for the most part done by local communities, and these tend to carry the burden on coral conservation. Although many non-profits and developing countries focused on reef health are funded by international organizations, the existing assumption remains that those who live near the reefs care more for them than individuals living far. Due to their limited resources, non-profits who implement the environmental conservation programs focus on groups with higher likelihood of donation (i.e. local communities). Few tools are available to managers to

[1] Changes in temperature due to changes in water composition (certain chemicals can change the quality of water) affect the algae living within the coral; the health of the photosynthetic partners is key to keeping coral alive. The algae have been known to be affected by change in water chemistry as well as temperature, and some believe them to be the cause of coral bleaching.

identify the type of donor who would contribute the most support towards coral reef conservation.

Rarely do program managers investigate the perceptions/views of the problem from potential donors not located near the reef, or those that are assumed would care (e.g. environmentalists, donors to other groups, etc.) Understanding the public's view of coral reef problems, specifically how they define the magnitude and scale of the problem, could help determine links between views and support. Are individuals with global views of coral reef issues (i.e. believe the problem is one of a global nature and not localized to the reef site) be more or less likely to donate to reef conservation those who find the reef problem a local issue (i.e. believe the problem is only localized to the reef site)? If those with global views have higher value of reefs, knowing where those individuals are located could potentially increase resources for conservation. Knowing what factors influence local donors could help managers devise strategies for improved donation behavior. Assumptions about perceptions of the boundaries of reef problems have not been tested empirically in previous literature. Linking the cause/problem and consequence/impact of coral reef degradation for donors might test assumptions about who is likely to provide support. Furthermore, knowing which individuals are likely to donate could help non-profits to target specific groups when constrained by a limited budget.

This chapter focuses on tests whether significant differences exists between donor groups on their views of coral reef problems, and if previous experience contributes to likelihood of being a particular kind of donor.

4.2. Causes, Impacts, and Views of Coral Reef Degradation

What kinds of factors shape how a person selects between two spatial scales of the causes and impacts of coral reef degradation? Previous research has suggested boundary selection (defined as a spatial boundary around a problem), is linked to power, identity and values (Pritchard and Sanderson, 2002; Ingram et al., 2004; Bloomquist and Schlager, 2005; Lach et al., 2005). Furthermore, decisions concerning spatial bounding of an environmental problem usually are contingent and contextual (Norton, 2005). Education, age and occupation are sources of knowledge which also could affect perceptions of environmental problems. Similarly, reading the newspaper, watching documentaries on ocean issues and participating in environmental activities might also contribute to the formulation of the causes, magnitude, and impact of coral reef deterioration. Other factors – like organizational affiliation, previous donations, and exposure to reefs – might lead to a formulation of the problem reflective of those experiences. Political ideology, religious values and trust in government reflect an individual's belief system and also play a role in the selection of spatial scale or environmental problems. In general, liberals tend to be associated with promoting government intervention for environmental conservation more than conservatives, and to some extent the former are viewed to be less in favor of federal management of problems. Other individuals may not trust governments as a whole in managing problems and might feel communities, private firms or even international agencies are better equipped at addressing environmental issues (Baden and Snow, 1997).

An assumption might be that if a person has seen corals in their natural habitat they will have a different understanding of the scale and magnitude of the problem

(AAAS, 2001, 2004). Seeing coral reefs in their natural environment might lead to the person feeling a connection to the ecosystems, appreciating it more in terms of aesthetic value and/or finding it worth less than habitats in his/her backyard. Believing the problem is technical and scientific in nature might lead to defining the problem as one where technology or science has the answer. Boundaries of the problem can change when the current scale cannot provide the resources to address the issue. Whereas sometimes problems are addresses at a city or state level, sometimes this scale does not encompass the whole problem. Scientists can help identify the source of a problem which in turn can help determine the size of the problem. The explicit or implicit boundary defines the area of inclusion of exclusion for whom and what should be part of the conservation effort. Generally, individuals with little use of the resources or living relatively far from it are excluded from a coral reef program. The coral reef purchase program in Fiji is attempting to increase the financial base. The Fijian community can no longer manage, monitor, and protect the reefs from poaching or pay for the costs of a diminishing reef ecosystem. The program is attempting to expand the boundary of people able to participate in conservation of the reef. Who should the non-profit target?

A large number of environmental organizations run on donations from the public. Thus, understanding the characteristics of donors can help design policies of who to target. The WWF and the Nature Conservancy both are dependent on the public/individuals providing monetary donations. When investigating influential factors on donation behavior previous work has tested demographic and socioeconomic variables (Bussell and Forbes, 2002; Chrenka, Gutter, and Jasper, 2003; Hudson and Jones, 1994; Lee and Chang, 2007; Smith, Kehoe and Cremer, 1995). Other studies have investigated

social and psychological characteristics of donors on donation behavior (Harvey and McCrohan, 1988; Lee and Chang, 2007). Variables such as age, gender, education, income, marital status and family have been included in previous donor behavior models as well as other factors like awareness of charitable issues, sense of social responsibility, and empathy (Bennett, 2003; Chrenka et al., 2003; Lee and Chang, 2007; Radley and Kennedy, 1995; Sargeant, 1999). Results about the impact of the previously mentioned donor characteristics on donation behavior have been conflicting (Lee and Chang, 2007). Less is understood about coral reef donors and the factors influencing their donations for coral reef conservation; most of the studies about donations have been focused on CVM variables rarely including factors like previous donation experience, cultural awareness and participation in ocean related activities.

Questions arise on how '*where people live*' might affect the selection in spatial scope and if perceptions about boundaries of the problem impact the level of care and thus public support of particular issues. Perhaps some land-locked Atlantans' bound coral reef conservation problems locally, leading them to think that they have no role in solving those problems from such a distance. Atlantans may not link their behavior with coral reef degradation. Maybe Atlantans feel Fijians are causing reef degradation and should therefore be responsible for correcting the problem-Fijian coral reef problems are local in nature. Or possibly Atlanta's place problems far away as low priority since they have limited time and resources, and are more concerned with local issues in their 'home'. People might perversely pick scales to leave the individual outside of the realm of responsibility. For instance, by defining the problem as a local Fijian problem, the person is then not responsible to provide help or feel obligated to be part of the solution.

Using data from the "Coral Reef Survey 2008", this paper looks at perceptions of coral reef problems and consequences, compares donors, and discusses how global/local the views of the Atlanta sample might be concerning Fijian reefs. The data will compare groups of individuals along a variety of characteristics (demographics, knowledge, coral reef perceptions, donation). In addition, a multinomial logit model is used to compare the likelihood of donation amongst donor groups. The results will attempt to shed light on the characteristics of donors, their views about coral reef problems, and how these differ for survey participants.

4.3. Research Questions

This chapter asks the following questions: 1- a) would those who donated to the Fijian conservation program also donate towards a program in the US?, and b) which characteristics (previous monetary donation, previous experience traveling, recycling behavior, sources of information and knowledge, income, children, race or gender) are significantly related to the likelihood of being a particular kind of donor?; 2- how do these donor groups (individual donates to both, donates to Fiji only, donates to US only, and does not donate to either) differ in terms of their understanding of causes and consequences of coral reef degradation? Like previous donation behavior studies, I hypothesize females will donate more than men (Newman, 2000; Lee and Chang, 2007), those with family (i.e. children) will give more, and those with higher income will also have higher likelihood of donating (Lee and Chang, 2007). In addition, I hypothesize individuals with more knowledge about coral reef problems will be more likely to donate to both programs compared to those who donate to neither. Also, groups will differ in

terms of their perception of coral reef causes and consequences, where those donors with more "world views" of the problem will be also those individuals who perceive coral reef impact to be at a global scale.

4.4. Methods

4.4.1. Data

Data was taken from the "Coral Reef Survey 2008" described in the Methods section of this dissertation. With a total of 32 questions, the survey was divided into three sections: section I- contained questions about the participants' experience activities and knowledge; section II-included the WTP scenario and related questions; and section III- was comprised of questions concerning values, travel, and demographics. This chapter will focus on the data gathered concerning the understanding participants had about the causes and impacts of coral reef degradation. Analysis of data for models and descriptive results was done using STATA, SPSS, ArcGIS and Excel. Geocoding used StreetMap data to create locater address file as well as opensource software on the web (BatchGeocoding).

4.4.2. Donor Models

Q1-Would those who donate to Fiji also donate to the US and which characteristics significantly influence the likelihood of being a particular kind of donor?

Previous research has used logistic and multinomial regression models to predict donation behavior (Chrenka et al., 2003; Schlegelmilch et al., 1997; Lee and Chang, 2007). As in previous studies, this study includes the variables of income, family status

(children in household), awareness of charities (measured as previous donation behavior), and gender. Although previous models include education early models for this study found education and income highly correlated. Therefore only income was used in this study, and found to be a better predictor of donation behavior when compared to education. Because this study was specifically interested in issues about perceptions of donors (the scale and magnitude of the problem), and a travel variable was used to control for previous international experience. The variables around knowledge, experience, and activity are the variables of interest. It is not the goal of the models to suggest causality but to test the presence of a link between the various donor characteristics and likelihood to be a particular type of donor. The literature suggests the directionality of the relationships of the previously mentioned variables as these being predictors of donation behavior helping address some of the issues around endogeneity.

Unlike previous coral reef CVM studies, this study asked individuals both about donation for a program located far from their residence (Fiji) or one closer (US) giving some indication of the preferences of donation behavior based on location. Therefore, donor groups fell into one of four categories: "Giver"-represents those who stated they would give to Fiji and also stated they would give to US; "Non Giver"-these individuals selected "no would not donate" for both the Fiji program and on in the US; "Local Giver"-includes all the subjects who stated they would donate to US program but not one in Fiji; "Global Giver"-comprised of those who only said yes to donation for Fiji program. These donor groups represent donation behavior and are not used as indicators of "environmentalism" but more as indicative of type of donation preference.

Willingness to Donate (WTD) is the dependent variable defined as the probability of being either a donor for both Fiji and US, only Fiji, only US or not donating to either program. WTD had 4 categories: NoFiji/NoUS (reference group), YesFiji/YesUS, YesFiji/NoUS and NoFiji/YesUS. The 'Global Giver' category included only 3 individuals and therefore was merged into the 'Local Giver' category; the 3 individuals had similar characteristics (e. g. travel experience and other) with those in the 'Local Giver' category; also these two groups share in common that they donated to only one program. The WTD variable was constructed from Q11 *"Would you give a one-time donation to the "Adopt-a-Coral" program in Fiji to restore 10 miles of reefs?"* and Q15 *"Would you give a one-time donation to the "Adopt-a-Coral" program if it was in the United States (eg. Hawaii, Florida Keys)?"* Both questions had 3 possible answers from which respondents could choose: "yes"; "no, not affordable/interested"; and "no, other". For purposes of this paper both "no, not affordable/interested" and "no, other" responses were recoded into "no".

A multinomial logit (Model 2) was created to test the likelihood of being a donor for coral reef conservation, specifically testing the likelihood of being a particular kind of donor (Giver, Non Giver, Local Giver or Global Giver). The dependent variable is nominal (not ordered) suggesting a multinomial as more appropriate as well as previous studies that used this approach to test donation behavior (Lee and Chang, 2007; Wooldridge, 2000). OLS is not likely the best fit for Model 2 since the dependent variable is binary compared to a logit or tobit. However, a logit is probably not the best fit for the data either since the data appears to cluster in three groups. An ordinal logit (ologit) was run but not found to be appropriate (Brant test for Parallel Regression

Assumption, Chi-Square =18.6 for All p>Chi-Square=0.045 violating the assumption). The multinomial logit (mlogit) appears to be the most appropriate test since there is no natural ordering between the donor groups; donating to one location versus both does not signify more donation. Donor groups are exclusive of each other much like a race variable. The dependent variable had a mean of 2.40 and a standard deviation of 1.41 with a total of 232 observations.

Table 18. Distribution of donor groups based on responses to WTP for coral reef conservation program in US, Fiji, Both, or Neither locations.

Respondents who stated they would be WTP towards conservation in Fiji, US, both or none	Responses to survey question	Freq.	Percent	Cum.
"Non-Giver"	NoFiji/NoUSA	105	45.26	45.26
"Local Giver"	NoFiji/YesUSA	25	10.78	56.03
"Global Giver"	YesFijiNoUSA	3	1.29	57.33
"Giver"	YesFijiYesUSA	99	42.67	100.00
Total		232	100.00	

Model 2 compares donor groups who either stated they would be WTP for conservation for Fiji and/or the US or none. The donor groups can be seen in Table 18.

Model 2 was as follows (Lee and Chang, 2007):

Equation 2

$$Model\ 2\ \ WTD_{(mlogit)} = \beta_{culture} + \beta_{ocean} + \beta_{movies} + \beta_{recycle} + \beta_{travel} + \beta_{donate} + \beta_{children} + \beta_{white} + \beta_{male} + \beta_{income} + e$$

where Willingness to Donate (WTD) for coral reef conservation by one group compared to those who would not donate to either was a function of *culture, ocean or movies*

experience, previous international travel, number of household children, race, gender, income, previous donation and recycling experience.

4.4.3. Variables

The variables used to capture knowledge/information sources (*k*) included cultural and movie experience (Table 19). Both of these variables represent total number of cultural activities attended or movies seen. The higher the number for either variable, the more types experienced per category. Ocean activity, recycling, international travel experience, and previous donation variables were used to explain behavior and experience (*b*). The last category representative of personal characteristics (*a*) of the individual included demographic variables race, household income, number of household children living in home (<18yrs of age), and gender.

The following table includes definitions and units for each of the dependent variables:

Table 19. Independent variables categories and descriptions including unit and survey question number (See Figure 3 in Chapter 3 for a full description of each survey question).

Independent Variables	Name	Definition		N	Mean (*Standard Deviation*)	Survey Question
Knowledge and Information Sources	Culture Experience	Total number of culture experiences	0-9 numeric	247	3.61 (3.14)	Q-8
	Movies	Total number of movies viewed	0-6 numeric	247	3.00 (2.34)	Q-1
Behavior and Experience	Ocean Activity Experience	Total number of ocean related activities experienced	0-8 numeric	247	2.95 (1.88)	Q-6
	Recycle	Total number of types of materials recycled	0-7 numeric	247	3.97 (1.94)	Q-5
	Travel Outside US	Experience traveling outside the US	1=yes 0= no	240	0.908 (0.289)	Q-22
	Previous Monetary Donation	Previous monetary donation in the previous year to a non-profit	1=yes 0= no	238	0.928 (0.258)	Q-17a
Personal Characteristics	Household Children (<18yrs)	Total of household children living in home	numeric	236	0.458 (0.867)	Q-28
	Race	"White" or Non-White (African American, Hispanic, Asian, Native American, Other)	1=White 0=Other	235	0.783 (0.413)	Q-32
	Gender	"Male" or Female	1=Male 0=Female	238	0.433 (0.496)	Q-25
	Household Income ($10,000)	Total estimated household income for 2007	$10,000 dollars	206	93.7 (63.8)	Q-29

The independent variables included binary coded variables like previous donation behavior (where 1 was individuals who gave a monetary donation to a non-profit in the year 2007), travel experience (traveled outside the US equals 1), race (1 white, 0 all other races), and gender (1 male and 0 female). The variable on movie experience captures number of movies the participant stated they had viewed. For example, if a person got a 1 in movie experience that would mean that of the questions on movies (*Jaws, Finding Nemo, The Lion King, March of the Penguins, Happy Feet and Jurassic Park*) the person said yes to at least one of these. The variables on TV experience (*Nova, Survivor, Planet Earth, Live Earth Concert, Shark Week, and Meerkat Manor*), cultural experience (aquarium, museum, lecture, etc.), recycle (appliances, batteries, cans, etc.), and ocean activity experience (swimming, sea fishing, boating, snorkeling, scuba diving, etc.) were also coded similarly. The variable for income represents the midpoint for the income category and was measured in $10,000's.[2] The model also included a variable on the number of children present in the household. For correlation matrix of the variables see the Appendix J.

Q2-How do donor groups differ in terms of perceptions of the causes and consequences of coral reef decline?

Several different donor groups are compared along a variety of characteristics including WTD for Fiji or US conservation, views of the causes and consequences of coral reef degradation, and demographics. The four primary donor groups were based on whether the individuals had stated they would donate to a program in Fiji, or in the US,

[2] Income was a categorical variable converted to a midpoint amount

or both or neither (The Non-Giver, The Local Giver, The Global Giver, The Giver) as stated in Table 18.

4.5. Results

4.5.1. Model 2

Q1-Would those who donate to Fiji also donate to the US and which characteristics significantly influence the likelihood of being a particular kind of donor?

Model 2 explains some of the likelihood of being a giver, non giver, or local/global giver (Table 20), WaldChi2 (20) = 42.46 with Prob<Chi2 = 0.002 and PseudoR2 = 0.1425 respectively where at least one of the variables differs significantly from zero. The model suggests ocean experience, recycling behavior, gender, and income as significant factors on being a particular kind of donor to both programs (Givers) or at least 1 program (Local/Global Givers) when compared to those who stated they would not donate to either (Non Givers), holding the other variables constant.

With more ocean experience, the risk of being in the Local/Global Giver donor group is 1.32 times[3] (Table 20 and Appendix K) more likely than being in the Non Giver group ($p<0.070$). This ratio is even higher when looking at Givers and Non Givers; the relative risk ratio is 1.56 between these groups ($p<0.000$). A person is 1.56 times more likely to fall into the Giver than the Non Giver donor group holding the other variables constant as experience in ocean activities rises. Thus, if the participant were to increase his or her ocean activity experience they are more likely to fall in the Giver or Local/Global Giver donor group. The model is not implying direct causality of donation

[3] For a complete table of RRR estimates see Appendix K

but suggesting a link between the type of donor and the number of previous ocean activities attended in the prior year of the survey being implemented. The model has assumed all ocean activities and types of materials recycled as having the same weight; thus "swimming in the ocean" was viewed to have the same impact as "boating".[4]

Similar to ocean experience, individuals who recycle more types of materials are more likely be a donor in the Local/Global Giver group compared to being in the Non Giver group. The relative risk ratios are higher between the Givers and Non Givers than Local/Global Givers and Non Givers. Those individuals with high amounts of recycling are 1.43 ($p<0.036$) and 1.25 (0.014) times more at risk to be in the Local/Global and Giver donor groups versus the Non Giver category.

Gender was a significant factor on the likelihood of being in a particular type of donor group. Holding the other variables constant, the relative risk ratio difference between men and women is larger 0.39 ($P<0.010$) more for the Giver versus Non Giver groups and only 0.25 ($p<0.022$) between the Local/Global Giver and Non Giver. The women's risk of falling into the donor groups is higher than for men when holding the other variables constant, suggesting women are more at risk at being a donor for one or more programs. The income variable was only significant between Local/Global Giver and Non Giver donor groups. High income individuals are likely to be Local/Global givers by a factor of 1.00 over Non Givers holding the other variables constant. The model highlights a few possible factors influential in the likelihood of participants being a particular kind of donor.

[4] Ideally a weight for each movie or experience would be preferable and provide a more accurate picture of the effects of these factors might have on likelihood of donor group. However, to date I have not been able to located weights for all the variables but it is a goal for future work.

Table 20. Model 2 (Multinomial Logit) results with robust coefficients, z values and p-values. The reference group is "The Non-Givers" who stated no to donating to either Fiji or US coral reef conservation program. N=193, WaldChi2 (20) = 42.46, Prob<Chi2 = 0.002 and PseudoR2 = 0.1425.

Local/Global Giver	*RRR*	*Robust coeff*	*std. err (for coeffs)*	*z*	*p<z*		*95% CI*	
Cultural Experience	1.0315	0.031	0.0920	0.340	0.736		-0.149	0.211
Movies Experience	0.9140	-0.090	0.1148	-0.780	0.434		-0.315	0.135
Ocean Experience	1.3235	0.280	0.1546	1.810	0.070	*	-0.023	0.583
Recycling Behavior	0.1.4313	0.359	0.1714	2.090	0.036	**	0.023	0.695
Travel Outside US	1.3867	0.327	1.1303	0.290	0.772		-1.888	2.542
Previous Monetary Donation Experience	1.2790	0.246	0.9525	0.260	0.796		-1.621	2.113
Household Children	0.9379	-0.064	0.3604	-0.180	0.859		-0.770	0.642
White	2.5520	0.937	1.0910	0.860	0.390		-1.201	3.075
Male	0.2577	-1.356	0.5919	-2.290	0.022	**	-2.516	-0.196
Income ($10,000)	1.0069	0.007	0.0041	1.670	0.096	*	-0.001	0.015
Constant	------	-5.052	1.4097	-3.580	0.000		-7.815	-2.289
Giver								
Cultural Experience	1.0422	0.041	0.0599	0.690	0.490		-0.076	0.159
Movies Experience	0.9860	-0.014	0.0762	-0.190	0.853		-0.163	0.135
Ocean Experience	1.5617	0.446	0.1179	3.780	0.000	***	0.215	0.677
Recycling Behavior	1.2556	0.228	0.0925	2.460	0.014	**	0.046	0.409
Travel Outside US	0.8022	-0.220	0.6825	-0.320	0.747		-1.558	1.117
Previous Monetary Donation Experience	4.8326	1.575	0.9953	1.580	0.113		-0.375	3.526
Household Children	0.8708	-0.138	0.2135	-0.650	0.517		-0.557	0.280
White	0.4852	-0.723	0.4705	-1.540	0.124		-1.645	0.199
Male	0.3903	-0.941	0.3637	-2.590	0.010	**	-1.654	-0.228
Income ($10,000)	1.0048	0.005	0.0034	1.400	0.161		-0.002	0.011
Constant	-------	-2.988	1.1076	-2.700	0.007		-5.159	-0.818

Non Giver is the comparison group (state they would not donate to the Fiji program and not donate to same program in the US; Global Givers who stated Yes to only Fiji (N=3) were merged into the Local Giver group comprising the Local/Global Givers; *** p<0.001, ** p<0.05, * p<0.10. See Appendix K for more details.

4.5.2. Donor Groups by Household Location and Coral Reef Problem Definition

4.5.2.1. Overall Perceptions of Causes and Consequences of Reef Decline

Those who responded to the survey had varying perceptions of the problems faced by coral reefs and of what would likely be affected the most by the decline of them (Figure 11). When looking at the overall pattern of understanding of coral reef problems, individuals responded by largely with "do not know" for almost all problems (between 25-50% responses throughout the types of problems). Table 21 shows the distribution of responses by coral reef problem (i.e. hurricanes, tourism/recreation) and extent to which the participant had read or heard about the problem. Within each coral reef problem, participants seemed to have heard and read the most about coral reef issues around large fleet fishing (28%) and stated to know the least about logging and agriculture (50%).

When survey respondents were asked about the possible implications or consequences the decline on coral reefs might have on a variety of issues, a large percentage stated biodiversity would suffer the most out of the possible issues with coral reef decline (30% of the respondents). The Georgia Aquarium and Atlanta Households were picked the least (Table 21). Like individuals understanding of the problems affecting coral reefs, respondents also had high percentages of "do not know" (17% second biggest percentage) for views on that which would be impacted the most with reef decline.

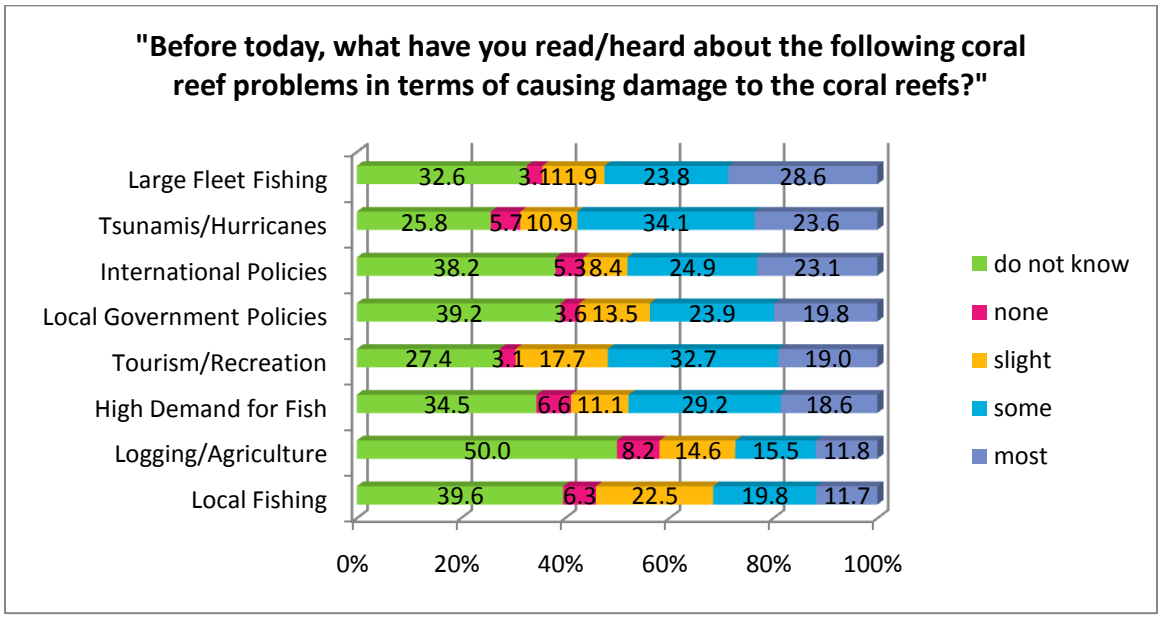


Figure 11. Percent distribution of responses for Q-10 which asked individuals their extent of exposure/information on the different coral reef problems.

Table 21. Frequencies and percentage of survey respondents for each category ordered from highest percent to lowest factor likely to be hurt the most with the coral reef decline.

Total	223	100
	Frequency	*%*
Biodiversity	67	30.0
Do Not Know	38	17.0
Humankind	30	13.5
Fijian Coral Reefs	27	12.1
Oceans	21	9.4
Fijian Fishermen	13	5.8
Fijian Tourism/Recreation	10	4.5
Global Economy	10	4.5
Fishing Industry	3	1.4
Georgia Aquarium	2	0.9
Atlanta Households	1	0.5
Other	1	0.5

4.5.2.2. Donor Group Perceptions of Coral Reef Causes and Consequences

The group labeled "The Non-Givers" are individuals who stated they would not donate for either program regardless of location, Fiji or the US. In contrast, "The Givers" stated yes to both questions on WTD for a coral reef conservation program. The last two groups were the "Global Givers" and the "Local Givers" for those who would only donate to Fiji or only to the US, respectively. In the following Figure 12, households are mapped by type of donor group. Looking at the map, the 'local givers' (green dots) appear to be distributed more towards the outside of the Metro area compared to the 'non givers' who appear more clustered towards the center. The 3 individuals found in the 'global giver' donor group were all on the outskirts of the metro area with one inside the City of Athens metro area. However, the sample of this group is too small to infer any particular pattern by location.

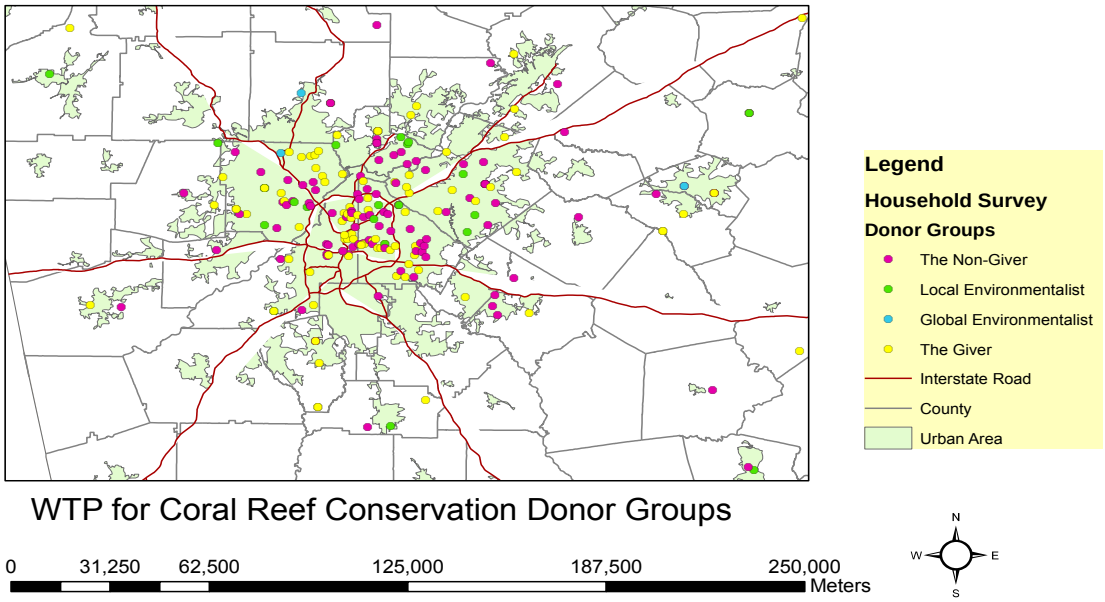


Figure12. Map of donors by geographic location. Households are color coded for type of donor place on the map using geographic coordinates (*The Non-Giver* with 105, *Local Giver* with 25, *Global Giver* with 3 and *The Giver* with 99 responses).

4.5.3. Fatigue and Non-Response Bias

Non-Response bias was tested by looking at those individuals who answered the question versus those who did not (i.e. missing, defined as a survey question left blank with unknown cause as to why this was the case). If one particular donor group has a larger percentage of missing values, which is called "No Answer", then this particular group might behave differently and not be comparable to the other groups. Chi-Square tests were run between donor groups for three types of questions: 1-High Effort (a question requiring time to complete with multiple components; 2-High Cognitive (a question where respondents must likely think carefully about their response requiring more cognitive effort; and 3-Easy (a question considered short and easy to answer and applicable to all respondents). The questions selected for each type can be seen in Table 22 (Chi-square results). The results suggest a significant percentage of Non Givers left highly cognitive and high effort questions blank, when compared to the Givers. However there was no significant difference between donor groups for the easy question; it is likely the percentage of missing responses was similar between Givers and Non Givers.

Table 22. Testing differences between "No Answer" responses by donor group where Non Givers are compared to Givers (*Givers includes all categories giving, Giver, Local Giver and Global Giver; this was done due to the presence of cells smaller than 5 making the Chi-Square test less reliable).

			Answered vs. No Answer				
			% No Answer		Non-Response		
			NonGiver	Giver	Pearson chi2(1)	Pr	
High Effort	Q10-Knowledge of Causes of Coral Reef Decline	High Demand For Fish	12.381	3.937	5.7264	0.017	**
		Hurricanes/Tsunamis	10.476	3.150	5.1019	0.024	**
		International Policies	10.476	5.512	1.9794	0.159	
		Large Fleet Fishing	9.524	4.724	2.062	0.151	
		Local Fishing	11.429	6.299	1.9197	0.166	
		Local Government Policies	11.429	6.299	1.9197	0.166	
		Logging/Agriculture	11.429	6.299	1.9197	0.166	
		Tourism/Recreation	10.476	4.724	2.8003	0.094	*
High Cognitive	Q16-Knowledge of Consequences of Coral Reef Decline		12.381	3.150	7.2131	0.007	***
Easy	Q3a-Do you own a Pet?		1.905	0.787	0.5622	0.453	

Response bias due to fatigue is a concern for both the question on causes and consequences of coral reef decline; both questions require somewhat more effort to answer when compared to the other survey questions. The responses could be due to a respondent's boredom and lead to misleading results about the characteristics of donors. Perhaps those who stated "did not know" did not because of a lack of knowledge, but due to a need to get through that particular question fast. Although pretesting via focus groups and experts did not highlight this as an issue, the larger percentage of "Do Not Know" responses suggests a small likelihood for response bias. It seems plausible that a larger number of individuals actually have little knowledge about what issues face coral

reefs, since the Atlanta Metro area is not near ocean water. To test whether the number of "Do not know" answers in these questions comparisons were made between Givers and Non Givers for highly cognitive, high effort and easy questions. Table 23 shows the summary results for the Chi-Square tests by question between groups. Only one question-"*Have you heard or read about Tourism/Recreation in terms of causing damage to coral reefs*"- of the composite Q10 question was significant where larger number of Non Givers stated "Do not know" versus Givers. For the highly cognitive question, Non Givers had 26% responding "Do Not Know" significantly different from only 8.94% for Givers.

Table 23. For those who did answer, tables shows the results testing differences between "Do Not Know" responses by donor group where Non Givers are compared to Givers (*Givers includes all categories giving, Giver, Local Giver and Global Giver; this was done due to the presence of cells smaller than 5 making the Chi-Square test less reliable).

			Of those who Answered: Answered vs. Do Not Know				
			% Do Not Know		Fatigue		
			NonGiver	Giver	Pearson chi2(1)	Pr	
High Effort	Q10-Knowledge of Causes of Coral Reef Decline	High Demand For Fish	40.21739	30.59701	2.2337	0.135	
		Hurricanes/Tsunamis	27.65957	24.44444	0.2995	0.584	
		International Policies	39.3617	37.40458	0.0888	0.766	
		Large Fleet Fishing	36.84211	29.54545	1.3386	0.247	
		Local Fishing	41.93548	37.9845	0.3526	0.553	
		Local Government Policies	38.70968	39.53488	0.0154	0.901	
		Logging/Agriculture	52.68817	48.0315	0.4657	0.495	
		Tourism/Recreation	34.04255	22.72727	3.5311	0.06	*
High Cognitive	Q16-Knowledge of Consequences of Coral Reef Decline		26.08696	8.943089	11.3503	0.001	***
Easy	Q3a-Do you own a Pet?		1.904762	0.787402	0.5622	0.453	

Results from both tables allude to a possible bias from no response and fatigue. However, it remains unclear as to what is causing the differences between the Givers and Non Givers. Perhaps the Non Givers skip questions and leave them blank because they in fact know less about coral reefs since they also had higher proportion of do not know answers compared to the Givers. Or, maybe these individuals because they were not interested in donating to either program (suggesting they care less about reefs) do not care to answer the questions. They skip questions not because they are not familiar with reef issues, but because they do not care about them. Another potential explanation could be simply there is something special unobserved about Non Givers leading them to have proportionally more "No Answer" and "Do Not Know" responses compared to Givers.

4.5.4. Donor Groups: Knowledge and Information

Amongst the donor groups concerning cultural activity (amount and type), the "Non-Giver" group had overall the least cultural experience. This donor group scored lower across almost all cultural activities (Figure 13 bar graph and Table 24 below amount per type). It is possible they had lower percentages because they actually do fewer cultural activities or it may also be that this "Non-Giver" groups has less tolerance for surveys. When looking at the tests for fatigue in the previous section resulted indicated a significantly larger proportion of the "Do not know" answers were found for Non Givers. Perhaps this explains a little of why this group scores lower on cultural activities. It may be they actually do fewer activities because they are less interested in these types of cultural activities reflecting their knowledge or vice versa.

Across all donor groups, Jaws was the most seen movie, followed by Jurassic Park. This to some extent is a reflection of the age of the sample. The average mean age was 52 years with a standard deviation of 13.6 where the larger percentage of the sample was between the ages of 40-68. A younger population exposed to newer movies such as "*Finding Nemo*" in which coral reefs are discussed might have fewer "Do Not Know" answers. Figure 14 shows the distribution of percent response by type of cultural activity. Givers had seen "*Finding Nemo*" more than Non Givers or Local/Global Givers.

Table 24. Distribution of Responses for *Knowledge and Information Sources* by Donor group. For each group, the responses represent number of individuals who had seen or views *Xnumber* of movies or cultural activities.

	Experienced at least _x_ of the possible cultural experiences									
Donor Group	0	1	2	3	4	5	6	7	8	9
The Non-Giver	34	7	6	6	7	17	11	9	3	5
The Local Giver	9	0	2	1	1	0	7	3	1	1
The Global Giver	2	0	0	0	0	0	0	1	0	0
The Giver	32	1	3	3	4	11	14	18	8	5
Total	77	8	11	10	12	28	32	31	12	11

	Experienced at least _x_ of the possible movies						
Donor Group	0	1	2	3	4	5	6
The Non-Giver	28	6	3	12	21	14	21
The Local Giver	9	0	3	1	4	4	4
The Global Giver	2	0	0	0	0	0	1
The Giver	27	3	7	6	18	19	19
Total	66	9	13	19	43	37	45

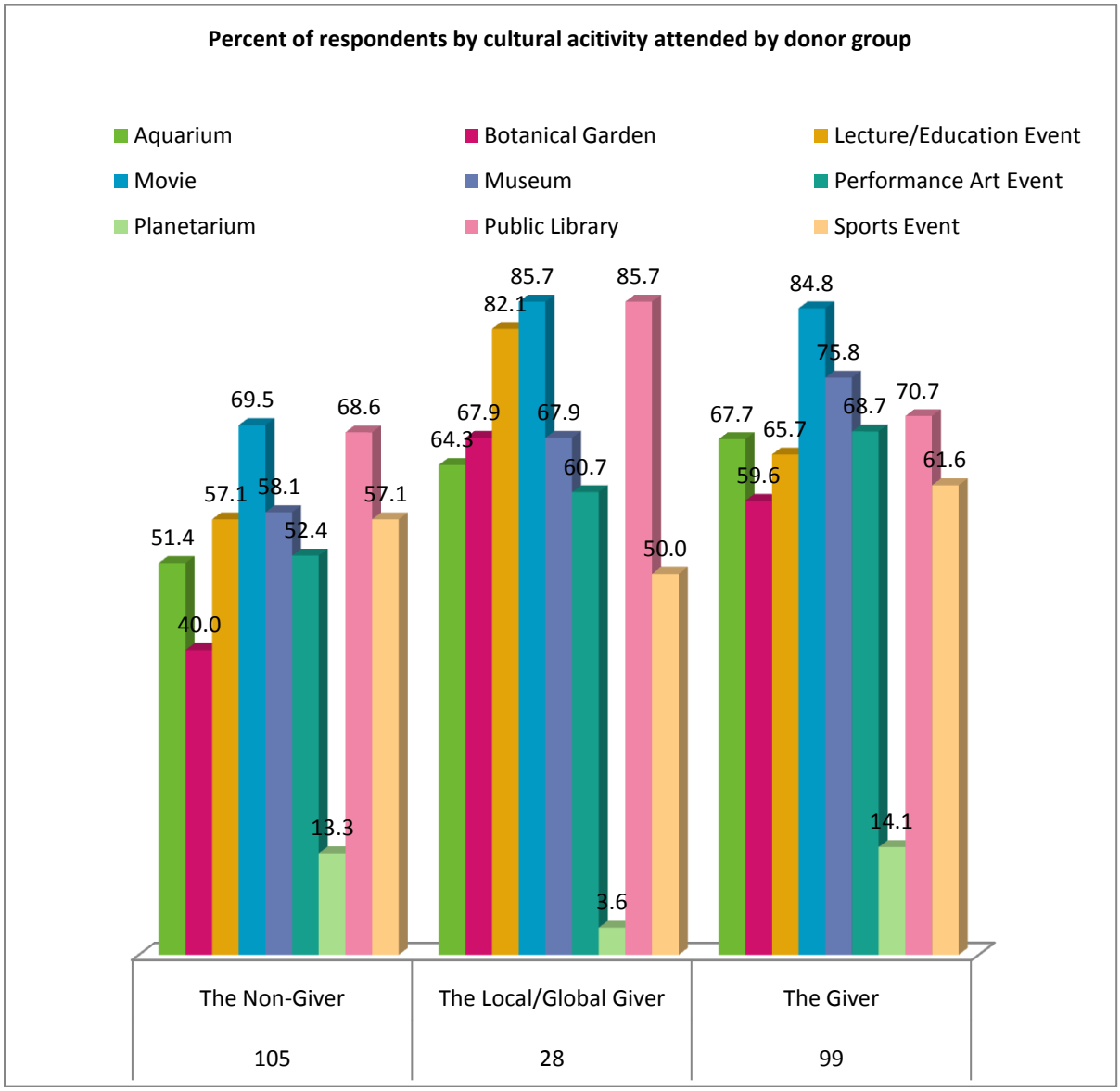


Figure 13. Percent of respondents who stated "yes" they had experience X cultural activity (e.g. Aquarium, Museum, etc.) by donor group. For example, 51.4% of Non-giver respondents stated "yes" they had been to the Aquarium. * The "Global Givers" have been merged with the "Local Givers" where this category represents the group of individuals who only stated yes to one program, either US or Fiji.

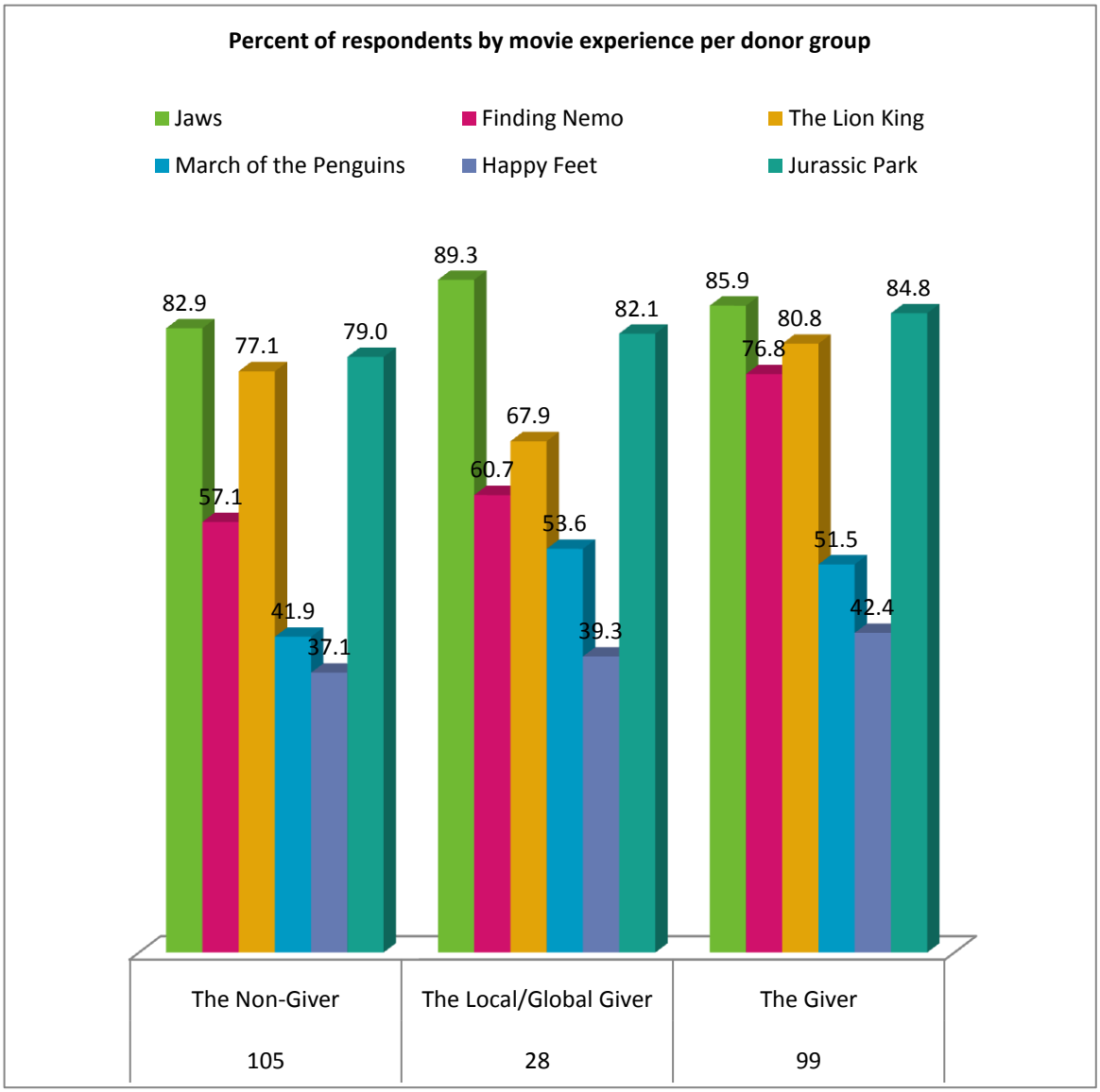


Figure 14. Percent respondents who stated "yes" they had experienced the movie (e.g. *Finding Nemo*, *Jurassic Park*, etc.) by donor group. For example, 82.9% of "Non-Givers" stated they had seen *Jaws*.

4.5.5. Donor Groups: Behavior and Experience

The largest percentages of respondents within donor group for ocean experience by type was "swimming in the ocean" and "boating" (Figure 15 and Table 25). This was for almost all groups. The ocean activity with the lowest percentages was "Ecotourism" not surprising because this term can be problematic unless clearly defined by activity. Interestingly enough, those who gave to either only Fiji or only the US, had the most snorkeling experience an activity likely to expose the person to reefs, and general done in areas with corals. All donor groups had close to 100% experience traveling outside the US (Table 26).

Individuals for all donor groups appear to recycle more than just one type of material (Table with counts). Paper and Plastic had the highest percent values across all archetypes (Figure 16). Local/Global Givers had the highest percentage for paper recycling and also appeared to have more responses of previous donation experience for education compared to the Givers and Non Givers. All had some previous donation experience. "The Non-Giver" group (Table 26) had the lowest percent of individuals with previous donation experience.

Table 25. Distribution of Responses for *Behavior and Experience* by Donor group. For each donor group, the responses represent number of individuals who had seen or views *Xnumber* of ocean activities, recycling, travel and previous donation to non-profit.

	Experienced at least ___ of the possible ocean activities							
Donor Group	0	1	2	3	4	5	6	7
The Non-Giver	3	45	16	14	15	5	5	2
The Local Giver	0	4	4	5	4	6	2	0
The Global Giver	0	2	0	0	1	0	0	0
The Giver	1	21	12	20	12	11	12	10
Total	4	72	32	39	32	22	19	12
	Recycled at least ___ of the possible materials							
Donor Group	0	1	2	3	4	5	6	7
The Non-Giver	12	9	12	17	20	17	14	4
The Local Giver	0	1	1	3	3	9	5	3
The Global Giver	0	0	0	0	2	0	1	0
The Giver	5	3	13	11	16	24	15	12
Total	17	13	26	31	41	50	35	19

Table 26. Frequencies of response for travel and previous donation experience by group.

	Experienced Travel outside the US	
Donor Group	No	Yes
The Non-Giver	12	92
The Local Giver	0	25
The Global Giver	1	2
The Giver	8	89
Total	21	208
	Experience previous donation to a non-profit	
Donor Group	No	Yes
The Non-Giver	13	91
The Local Giver	1	23
The Global Giver	0	3
The Giver	2	95
Total	16	212

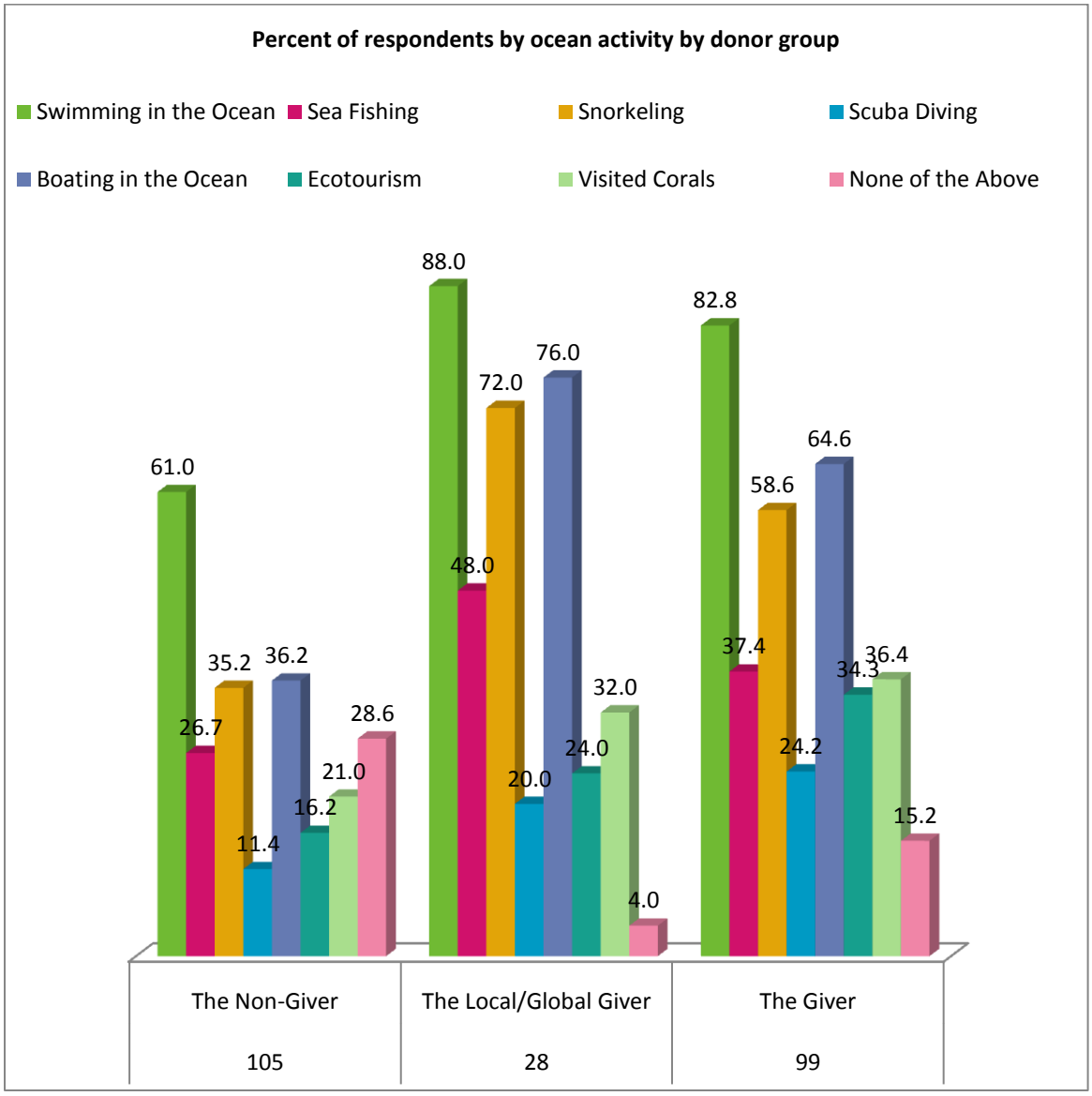


Figure 15. Percent of respondents with experience by type of ocean activity within donor group.

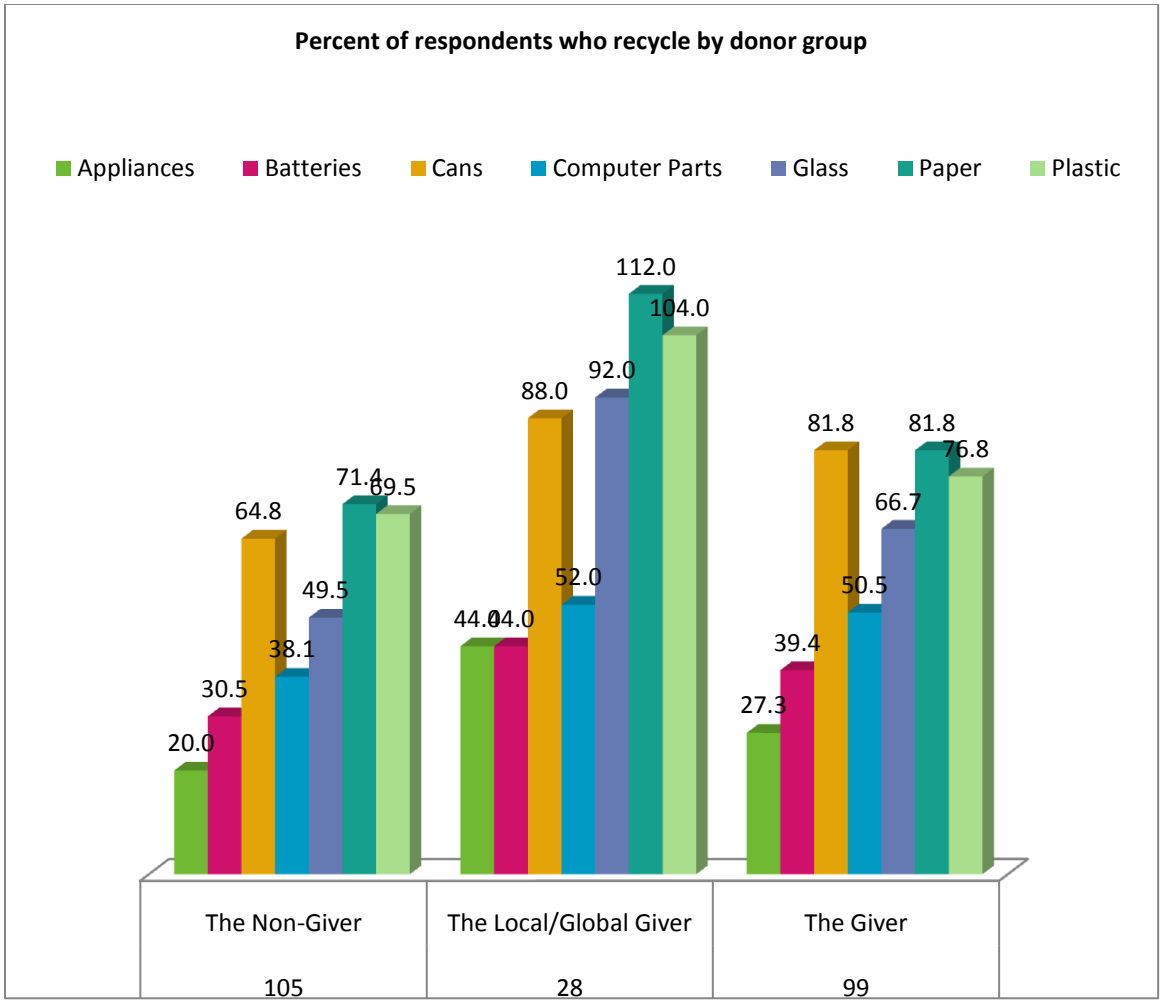


Figure 16. Percent of respondents with recycling experience by type of material within donor group.

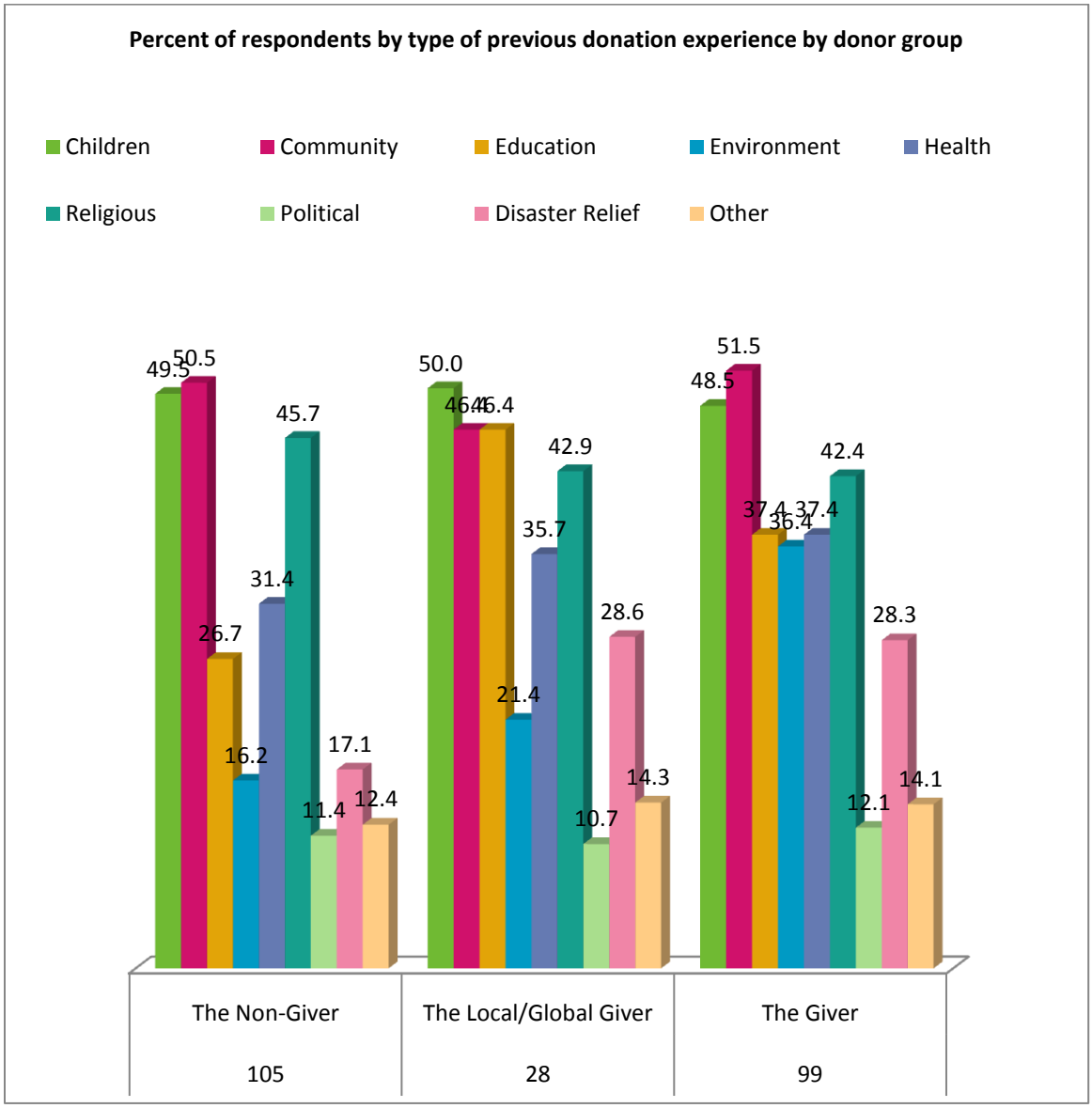


Figure 17. Percent of respondents with previous donation experience by type of non-profit/group of donation within donor group.

4.5.6. Donor Groups: Personal Characteristics

All groups exhibited a similar pattern concerning responses about children living in the household. Most individuals had 0 or 1 children residing in the home (Table 27). Table 27 shows large percentages within all donor groups of households with no children. Within all groups, the race "Caucasian/White" had the highest number of responses. Thus, all donor groups were primarily comprised by whites and not minorities even with a oversampling of Hispanics and low income households. The distribution of income categories within groups varies more for the groups "The Non-Giver" and "The Giver" which is not surprising since they have the larger number of donors compared to the other donor groups.

Within each group, percentages of donors by income category differed. Individuals in the "Giver" group had higher percentage of people with incomes on the 110k income category (22.2%) when compared to "Non-Giver" (10.5%).

Table 27. Distribution of Responses for *Personal Characteristics* by donor group. For each group, the responses represent number of responses by category.

	Number of children < 18 years of age					
Donor Group	0	1	2	3	4	5
The Non-Giver	71	16	10	2	1	1
The Local Environmentalist	18	2	3	2	0	0
The Global Environmentalist	3	0	0	0	0	0
The Giver	69	16	9	1	1	0
Total	161	34	22	5	2	1

	Race	
Donor Group	Non-White	White
The Non-Giver	27	72
The Local Giver	3	22
The Global Giver	0	3
The Giver	18	79
Total	48	176

	Gender	
Donor Group	Female	Male
The Non-Giver	51	51
The Local Giver	16	9
The Global Giver	3	0
The Giver	58	39
Total	128	99

Cont. Table 27.

	Income													
Donor Group	<30	30	40	50	60	70	80	90	110	137.5	175	250	350	400
The Non-Giver	9	9	8	9	12	8	4	4	11	11	3	1	1	1
The Local Giver	0	0	1	1	2	1	3	3	0	1	4	2	0	0
The Global Giver	0	0	0	1	1	0	0	0	0	0	0	0	0	0
The Giver	2	5	7	2	5	12	7	5	22	4	10	4	0	1
Total	11	14	16	13	20	21	14	12	33	16	17	7	1	2

4.5.7. Donor Groups: Views of Coral Reef Problems and Impacts

4.5.7.1. Part 1- Donor Perceptions of Coral Reef Problems

Coral reef problems can be divided into three dimensions based on the causes of coral reef decline: 1-policy issues (local and global policies); 2- natural and non-natural issues (tsunamis/hurricanes, logging/agriculture and tourism/recreation); and 3- fishing issues (large fleet fishing, local fishing, and high demand for fish). If looking at all dimensions, the donor group Local/Global Giver had differing distribution of answers compared to Givers and Non Givers which had closer frequencies of responses.

Looking at the answers for local and international policies as problematic for coral reefs, Givers and Non Givers had similar distribution of responses (Figure 18 a and b). For the category of "most", Local/Global Givers had larger percentages than other donors. For the natural/non-natural issues dimension (Figure 19 a, b, and c), each donor group varied their views between tsunamis, logging and tourism. Looking at only the highest percentages per problem by donor group, the "Non-Giver" believed tsunamis/hurricanes were somewhat causing coral reef damage (more than logging or tourism). They did not appear to know if logging and if tourism/recreation was damaging to coral reefs. The "Local/Global Giver" had the lowest percentages of 'do not know'.

The final dimension of coral reef problems was concerning fishing issues (Figure 20 a, b, and c). Again looking only at the largest in percent response per donor group, the "Non-Giver" did not know about all three issues as being causes of coral reef decline. The "Local/Global Giver" thought large fleet fishing was most damaging. The group "The Giver" seemed to believe the large fleet fishing had more effect than high demand for fish on coral reef decline.

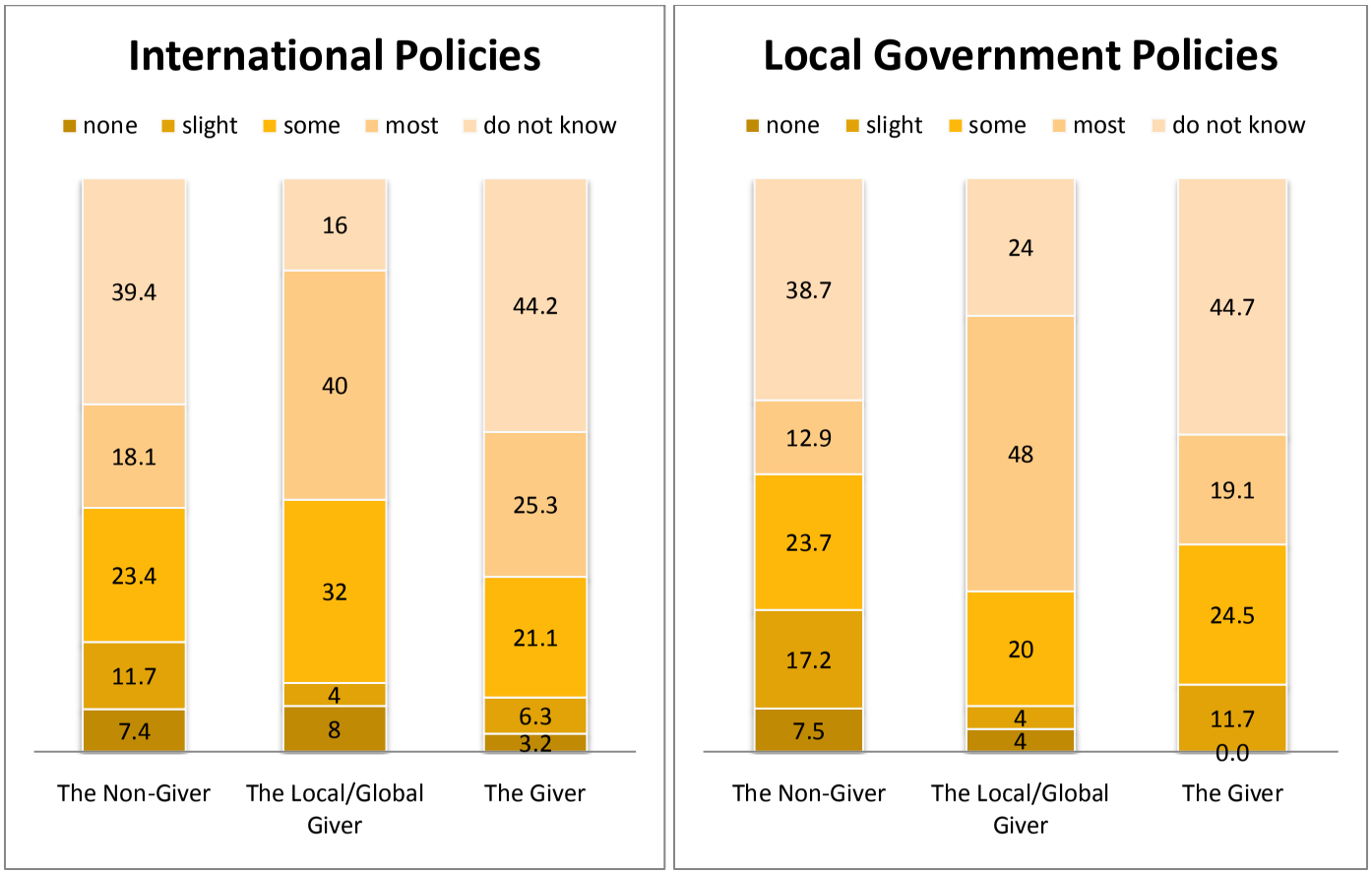


Figure 18. Extent to which each donor group views policy issues as problems causing damages to coral reefs. a) International Policies and b) Local Government Policies.

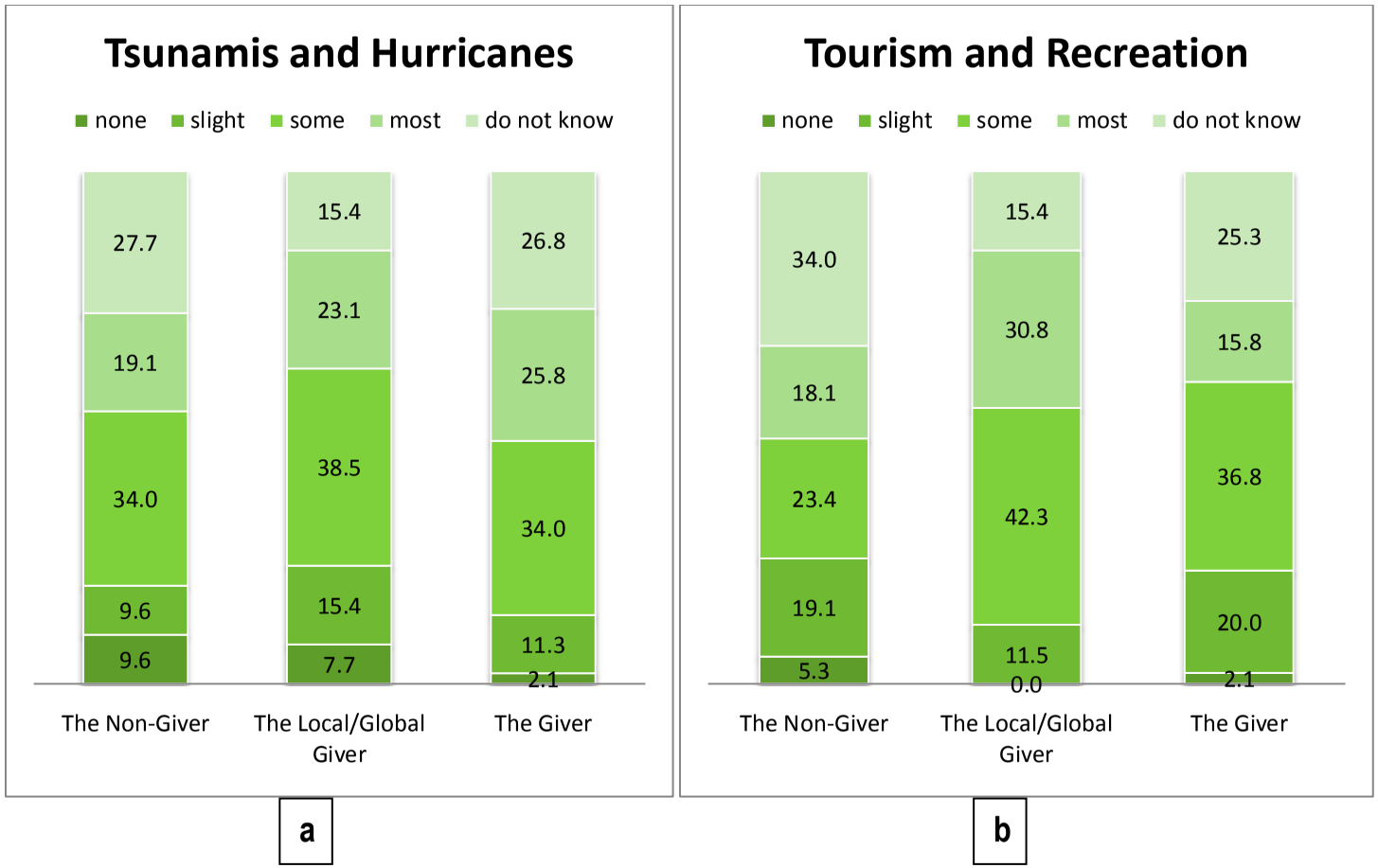
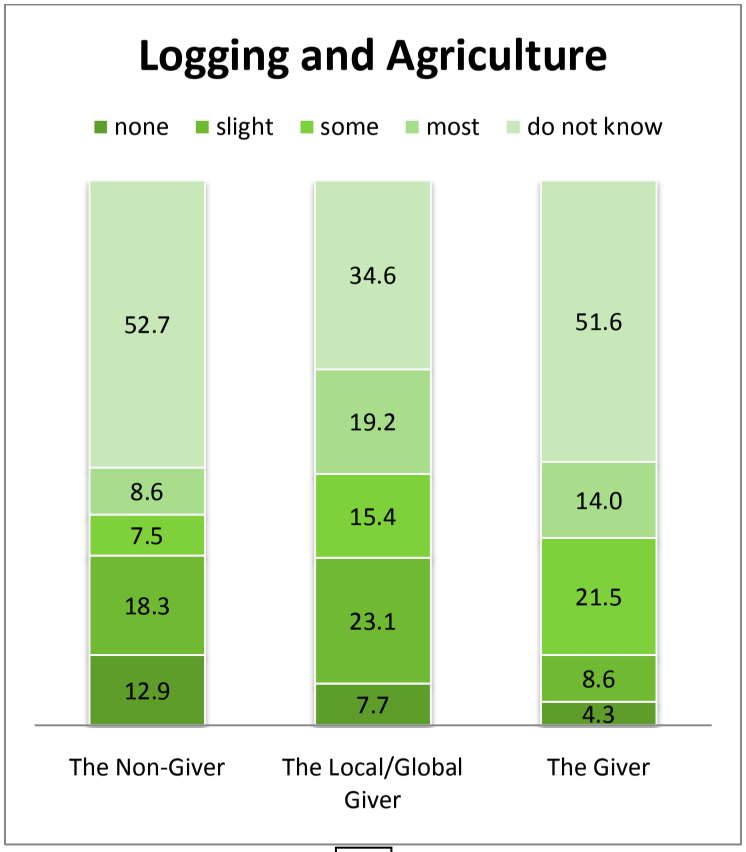


Figure 19. Extent to which each donor group views natural and non-natural issues as problems causing damages to coral reefs. a) Tsunamis and Hurricanes, b) Tourism and Recreation, and c) Logging and Agriculture.

Cont. Figure 19.



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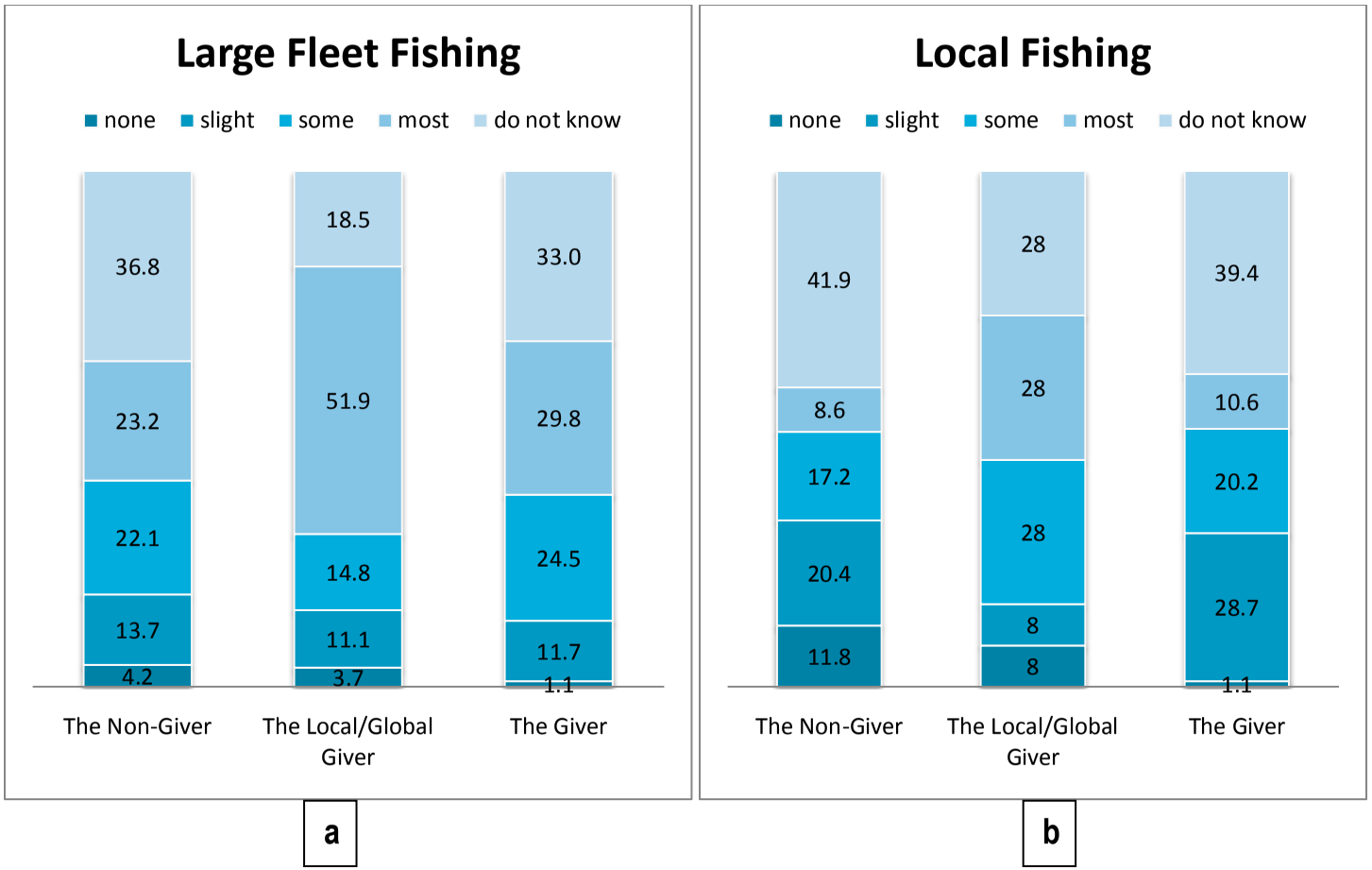
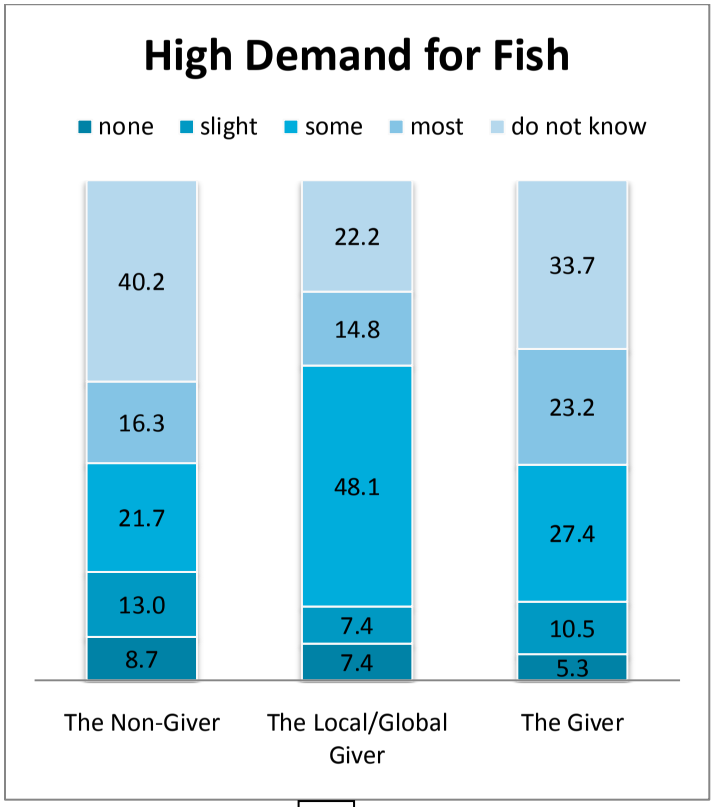


Figure 20. Extent to which each donor group views fishing issues as problems causing damages to coral reefs. a) Large Fleet Fishing, b) Local Fishing, and c) High Demand for Fish.

Cont. Figure 20.



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4.5.7.2. Part 2- Impacts/Consequences of coral reef decline on varying issues by donor group

Only one individual believed Atlanta households would be hurt the most by coral reef decline were and this person was from the Non Giver group (Table 28 and Figure 21). They also had the largest "Do Not Know" percentages of all donor groups. Testing (discussed in the earlier section) found Non Giver "Do Not Know" responses were significantly more compared to the other donors. In biodiversity, most of the individuals who thought this would be hurt the most came from "The Giver". The next largest group for biodiversity was "The Non-Giver" group. According to "The Givers", Fijian communities would be hurt the most with Fijian coral reef decline. For Fijian fisherman and tourism/recreation, over 50% and 80% of those who believed these to be hurt the most came from the "The Non-Giver" donor group.

Overall when looking at the distribution of groups by party affected, donors found the Fijian community, Humankind, Oceans and Biodiversity as those hurt the most with the decline of coral reefs. As mentioned previously, a large percentage of responses were in the "Do Not Know", almost as many as those for Humankind. The results suggest two major categories for what will be impacted the most as reefs deteriorate and either it's the ocean or people. Almost as many respondents believed the local community would suffer with reef loss as the global community (i.e. humankind). For those who were not interested in donating to either program, Fiji or in the US, the expectation might be that they care less about the environment that those who stated they would donate. However, looking at the biodiversity category there are as many responses for the Non Givers as Givers. The Givers dominated the responses; they found both local and global impacts

with the decline of coral reef health. Very few marked the category of "Global Market" as being impacted by health reef decline or any industry related to reefs for that matter (The Georgia Aquarium and Fishing Industry).

Table 28. Number of responses (counts) per problem by donor group.

	Atlanta Households	Biodiversity	Fijian Community	Fijian Fishermen	Fijian Tourism	Fishing Industry	Global Economy	Humankind	Oceans	The Georgia Aquarium	Other	Do not know	total
The Non-Giver	1	24	7	8	8	1	7	5	6	1	0	24	92
The Local Giver	0	6	2	2	2	1	0	4	3	0	0	3	23
The Global Giver	0	1	0	0	0	0	0	1	0	0	0	1	3
The Giver	0	31	18	3	0	1	3	20	12	1	1	7	97
Total	1	62	27	13	10	3	10	30	21	2	1	35	215

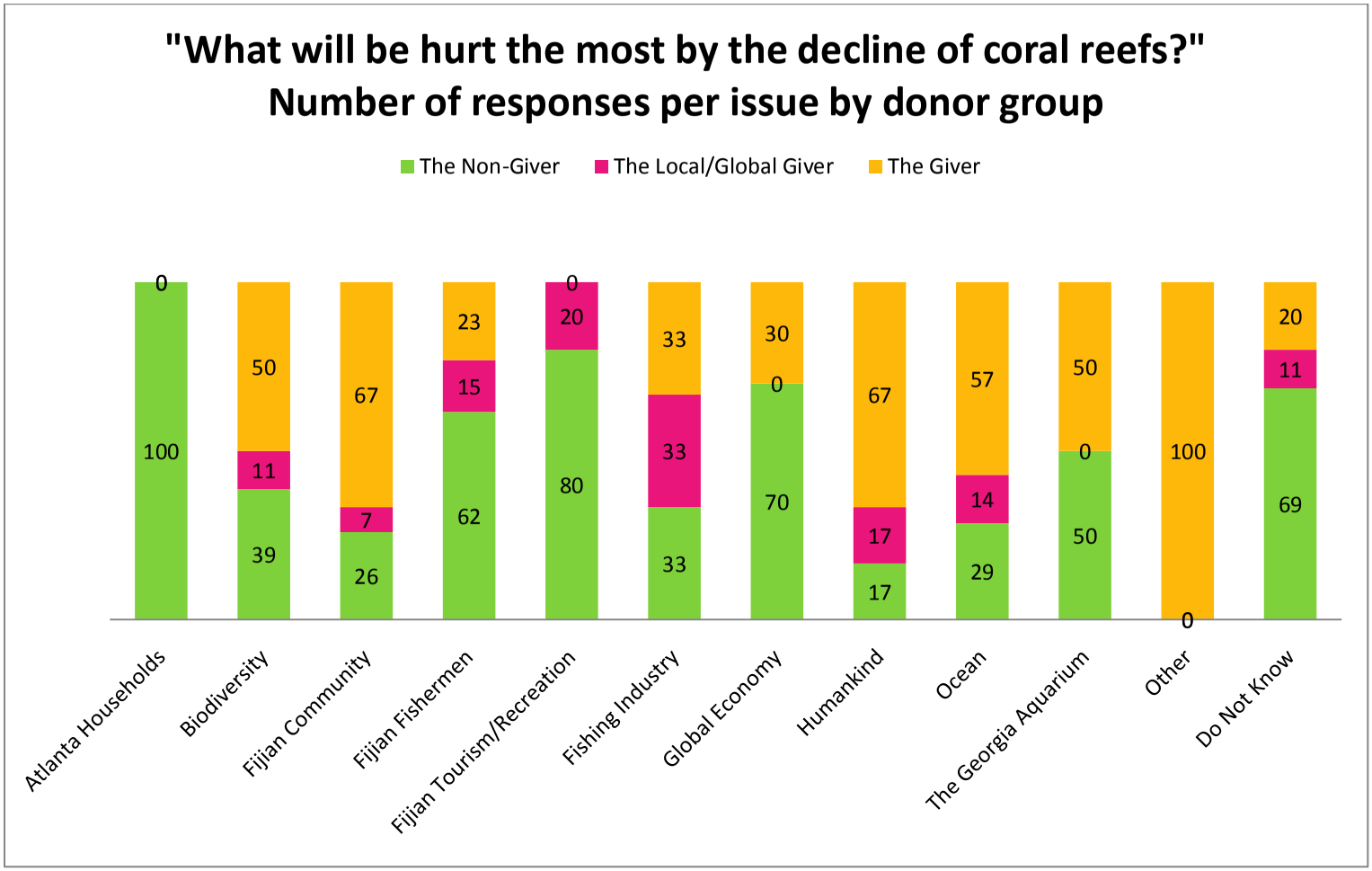


Figure 21. Percent responses by donor type for each type of entity likely to be affected the most by coral reef decline.

4.6. Discussion

4.6.1. Becoming a Giver, Local/Global Giver or Non Giver

For the most part, individuals were either a Giver (99) or Non Giver (105); the Local and Global groups were smaller in number, with the Global having only 3 individuals and it was merged into the Local/Global Giver group for analysis. These donor groups varied in their "knowledge" and thus sources of information on *Knowledge and Information Sources* category. Although limited, this category attempted to capture where individuals might be acquiring knowledge about the environment which could be shaping views on coral reef problems. This survey did not ask about reading habits (another possible measure of information) of the respondents. However, much that is known today about the marine environment might come from an aquarium experience and movie documentaries. Thus, capturing movie and cultural experience seemed appropriate at as a proxy about ocean knowledge. This study did not find knowledge as it was measured to have a significant effect on the likelihood of being a particular kind of donor. Some possible reasons for this are related to the operationalization of knowledge and information. First, perhaps the use of cultural and movie experience is not an appropriate proxy for knowledge where amount spent reading newspapers or magazines might have captured this effect better. Other ways to capture knowledge include specific questions about coral reefs. Although the survey did include the question, "What is a coral?" the variable seems less reliable than cultural experience and movie experience. A large number of individuals marked "animal" the correct response versus "plant". Individuals might have felt a need to answer 'correctly' and done research on coral reefs to determine coral as being 'animal' and not plant. Second, the small size of the sample

makes the results difficult to generalize and these could be the group of outliers; their behavior might be the minority and not majority.

The data suggest donor groups have slightly different percentages of cultural experiences. The "Non-Giver" group had the lowest percentages for most cultural activities; this would indicate that this group who did not donate to either a program in Fiji or the US had less "culture" experience/exposure than the other archetypes-less knowledge. Assuming individuals with more cultural experience are more likely to know about reefs and potentially care more, selecting to donate towards their conservation, the data would lead one to believe Non Givers know less, since they did not donate. Yet, this donor group had the largest percentage of 'do not know' responses compared to the other groups. Tests on fatigue found significant difference in the proportion of "do not know" responses compared to Givers (include Local/Global Givers). However, it remains unclear as to why this difference exists. Perhaps the Non Givers care less about coral reefs, as suggested by their donation behavior, and this leads them to be less likely to read or find interest in issues about coral reefs. Maybe this group, who also had higher number of blank answers, might actually know just as much as givers, but because they are not interested in the subject of reefs decided to leave the questions unanswered. Or maybe Non Givers are a special group with other reasons as to why they scored low on knowledge and as to why they stated they knew so little about coral reef problems.

The category on *Behavior and Experience* considered influential in the likelihood of being a certain kind of donor showed the Non-Giver group as having slightly lower levels of ocean experience, recycling, previous donation experience, and international travel compared to the other archetypes. The multinomial logit found ocean experience

and recycling behavior to increase the probability of being a Local/Global Giver or Giver, compared to being a Non Giver. Having more ocean experience (number of ocean activities) suggests individuals are more likely to be in a 'giving' category. Personal experience such as swimming in the ocean can make the person feel connected to a particular place. For the most part, going to the beach tends to be a positive event and may be influencing a person's likelihood of donation. When comparing percentage of individuals per ocean activity, the values for the "Non-Giver" appear slightly lower than "The Giver" percentages for ocean swimming (the most prevalent ocean activity across all archetypes).

Again like for ocean experience, recycling shows up as a significant factor on the likelihood of being a donor from one of the 3 donor groups. Looking at the distribution of materials recycled by donor group, these appear to have similar patterns; low percentages can be seen for appliances, batteries, computer parts, and higher percentages for paper plastic and glass. Comparing all four archetypes, the "Non-Giver" group seems to be recycling less. Individuals with previous donation experience might be more inclined to donate again, and thus those in the survey who previously donated to a non-profit would be expected to show up in the donor group "The Giver" or "Local /Global Giver" versus "Non Giver". The data found all groups have individuals with previous donation experience and for the same categories-Community and Children. This may be one plausible reason as to why the "Non-Donor" group was not willing to donate to the coral reef program. These individuals may already be donating towards other causes, and care more for them. "The Giver" archetype had larger percentages for all categories of donation.

Interestingly enough women seem more likely than men to be in a donor group. One of the hypotheses mentioned in the introduction stated women would be more likely than men to donate. Findings from this study appear to support previous work. All 4 donor groups had similar demographic composition when looking at the category of *Personal Characteristics*. These were comprised mostly of whites and very few minorities, households with no more than 1 child living in the home (most with none), and close to 50% gender divide with exception of the "Global Environmentalist" group (all female). However when looking at income, the archetypes differ in their distribution by income category. Whereas "The Non-Giver" group had more people in the lower income brackets, the "Giver" archetype had more people in the higher income categories. This suggested the "Giver" group had higher overall income, as expected since they stated they would be willing to donate to the coral reef program in Fiji and also in the US. The observation that those with higher income have more disposable income and thus likely to donate more appears to be holding, at least using the current donor group definitions.

4.6.2. Coral Reef Problems: Causes and Consequences

Two aspects of the definition of a problem were investigated: 1- the types of issues affecting coral reefs considered the causes of reef decline; and 2- the impacts, effects of consequences of coral reef decline. The results indicate as a whole the survey respondents view global issues as the main cause and biodiversity loss as the consequence of coral reef decline. In other words, the sample views the problem facing coral reefs as being caused by larger global events (i.e. large fleet fishing and high

demand for fish) and having global impacts (i.e. biodiversity and humankind). Respondents believe the problems affecting coral reefs to be large fleet fishing, natural events (tsunamis and hurricanes), and international policies, all issues at of larger global scale. Biodiversity was listed as being the most likely to be hurt the most with coral reef decline, and also a less local and more global effect.

Of the problems presented, individuals seemed to know the least about logging and agriculture and the effects of these on reefs. In addition, participants stated they knew the most about large fleet fishing as problematic and damaging to coral reefs. It would seem survey respondents are selecting larger activities as the causes of local Fijian reef decline, such as large fleet fishing. This activity impacts reef health by depleting larger open ocean fish leading locals to place fishing pressure on reef fish. The decrease of these herbivores on the reef increase algal outbreaks and weaken reefs natural defenses. However, the problem suggested directly damages reef health, logging and agriculture due to the runoff and subsequent effects of nutrient loading of sea water, was something about which most individuals knew relatively little. Concerning who or what will be impacted the most as coral reef health declines, the most popular response was biodiversity with over 30% of the sample. Yet, a large group also stated to not know what would be affected or hurt the most with coral reef decline (17% of the sample responded do not know, the second largest response after biodiversity). The respondents appear to believe they have limited understating and knowledge, as a whole, about coral reef problems.

Even though the "Non-Giver" group appeared to have the most knowledge about the problems facing reefs, they are the least likely to donate to either conservation

program. This might suggest this group might be a protest group. Perhaps these individuals do not want to donate to either program more because they oppose the type of program, implementation or goals. In general, individuals who know more about a particular issues tend to exhibit higher likelihood to care and donate for those issues they know more about (at least compared to the other groups).

4.6.3. The Problems with Coral Reefs

The problems with coral reefs could be defined across three dimensions. The first, the policy issues dimension suggesting local and global policies are contributing to coral reef decline. The second dimension was the natural and un-natural issues dimension some of which come from natural events and others from man-made activities. Here, coral reefs are being affected by tsunamis/hurricanes, logging/agriculture, and tourism/recreation. The third and final dimension contains issues concerning fishing and its effects on coral reef health. Within this dimension the problems include large fleet fishing, local fishing and high demand for fish. These dimensions were shaped by the type of problems asked in the survey.

As the health of coral reefs declines, storm damage is higher, fish stock declines altering ocean food webs, and potential profit from tourism, which requires live health coral for maximum diving experience, decreases. The individuals in "The Giver" archetype compared to "The Non-Giver" more likely felt that larger systems would be affected by the decline in reef health (Oceans, Biodiversity, and Humankind). A larger percentage of responses impacts of reef decline were within smaller scale issues such as Atlanta Households, Fijian Fishermen, and Fijian Tourism and included persons who

would not donate to either program-those from "The Non-Giver" group. The category that seemed somewhat at odds was the distribution of responses for global economy. This would likely fall under a larger system affected by coral reef decline, thus if the previous mentioned pattern held, then it would be expected to have larger percentage of "The Givers" compared to "Non-Giver" responses. It may be likely that this category was not well understood by the respondents. Or, maybe individuals felt the global economy applied to their local economy.

4.7. Implications and Conclusions

Coral reefs have been declining and are expected to lose over 33% of their cover within the next two decade assuming current environmental trends continue (Conservation International, 2008). These highly biodiverse ecosystems are connected to the larger oceanic food chain and changes to reefs can lead to larger global impacts on fish stock, storm damage on coasts and local economies dependent on healthy reefs for tourisms. Findings from this study suggest ocean experience, recycling, gender and income are positively associated with the likelihood of being a Giver or Local/Global giver more than a Non Giver. The data found that with increasing number of ocean activities experience as well as recycling more types of material, people were more likely to be "Givers" than "Non-Givers". Gender and Income appear to also have some impact on the type of donor a person could likely be; women and those households with higher income are more likely to fall in the Giver and Local/Global giver donor groups. This type of information/data may be of use for local managers who can only target specific groups due to budget constraints. Instead of worrying how much knowledge a person has

about coral reefs, these organizations might focus more their efforts not on information dissemination but on promotion of ocean experience. Or possibly, increase donation behavior towards Children and Community issues, which leads to increased overall donation experience, this leads then to higher likelihood of donations for coral reef conservation.

Those who donate towards the conservation of Fijian reefs are not necessarily the same people who donate towards a US reef protection program and vice versa. In this study the large number of Non Givers may be due to distrust in the program and not necessarily in an overall willingness to pay for coral reef conservation. The highest percentage of participants would not donate to either program. There were few people who would donate towards the Fijian program and not towards one similar in the US. However, although there were more responses to donating in the US and not Fiji, suggesting people might care more about local programs, surprisingly, 42.6% would donate to both programs. Recent studies have found a significant number of people give due to a "warm-glow" effect-they give to because they feel good about donating (Nunes and Schokkaert, 2003). Regardless of why individuals donate (a large percentage of this groups' motivation to help the environment), the possibility of gaining Atlanta nonusers to support distant environmental programs like the one in Fiji seem highly plausible. The fact that thousands support international projects in distinct locations to Atlanta (Malaysia, China and South America) donating to projects by the World Wildlife Foundation, CARE and other international groups, supports these findings.

A large portion of travel tends to be to locations with beaches and ocean activities. One might assume that those who travel more, especially to locations near or

on the sea, will gain greater level of knowledge or experience. These individuals might be more likely to "care" for these environments they have visited before. Along the same lines, those who travel more may place higher value on local issues since they know what lies in the other "backyard".

CHAPTER 5. A Practitioner's Guide to Coral Reef CVM Survey Research

5.1. Introduction

As mentioned in the previous chapters of this dissertation, measuring the value of coral reefs requires capturing both use and non-values. Previous studies had focused on use values for coral reef primarily around tourism (diving, fishing, snorkeling) and fishing (Arin and Kramer, 2002; Asafu-Adjaye and Tapsuman, 2008; Bhat, 2003; Brander, Beukering and Cesar, 2007; Mohamed, 2007; Oh, Ditton, and Stoll, 2008). Fewer studies have taken into account the potential values from non-use characteristics of reefs such as the value for biodiversity, future generations and cultural/historical richness. The measurement of non-use values has been in the past absent in part due to the costs of using non-market methods such as CVM, but also in part because identifying the individuals with these values (non-use) has posed a problem. Thus, even more absent from the literature has been the potential contribution of the nonusers, likely making up a large portion of total value. The share of nonuse value for reefs of the total value is still not known. Are non-users primarily located near the resource and if not where else might they be found? To date no study has investigated the potential contribution of non-use value by individual's located "far" coral reefs.

This chapter discusses the possible overall revenue of a sample of Atlanta households located far from the Fijian coral reefs. This information can provide insights about the revenue maximizing bids important for non-profits like *Sasalu Tawamudu Fiji* (STF), which are soliciting donations for Fijian coral reef conservation. The budget to manage this program for coral reef conservation in Fiji by STF will rely heavily on

donations. The nonprofit has not determined which pricing strategy would lead to maximum revenues. The conservation program takes donations and these are then used to locally manage a small area of coral reef within a shallow lagoon. Individuals donate any amount they wish online using PayPal and anyone around the world can submit a donation. All that is required is a credit card; there are no limits on the amount or on the location of the donation and donor. Could it be better to segment the market and price discriminate (using different characteristics including geographic location, views of coral reefs and education level) to increase the potential incoming revenue for STF? Which characteristics might yield the most revenue?

Although price discrimination has been more prevalent in the private sector, the public and nonprofit use of market segmentation is gaining some, but limited popularity (Harvey, 1990). Potential for higher revenue exists when price discriminating, but this is not always viewed as a fair practice (Varian, 2000), particularly for those paying the more expensive price. Ultimately the goal of the program will determine the choice in whether a flat price (same for all) or price discrimination (based on individual WTP) is selected. Varian discusses the example of AIDS drugs and anti-malaria medicine; he finds that for the first kind of price discrimination (flat price) leads to more consumption of the drug and for the later a flat price increases the number of people with anti-malaria drug. Learning a person's WTP for coral reef conservation could help determine where price discrimination might be beneficial and allow STF to potentially charge the price the person would be WTP.

Using data from the Coral Reef Survey 2007 and results from the WTP models in Chapter 3, revenue estimates are calculated and discussed. Several pricing strategies

using market segmentation are presented. According to Sachs (2009) in his recent book "Common Wealth: Economics for a crowded planet", he suggests the value of environmental goods to be one of the big issues for the next century. He discusses how previous decisions about the environment included only use price and nonuse value, had been to some extent, absent within the total price of the good. A need to better understand valuation for nonuse values could lead to better environmental policies (Sachs, 2008). A recent meta-analysis of the value of coral reef recreation found an average of 10 new studies were published each year on coral reef valuation with the trend likely to increase over time (Brander, Beukering, and Cesar, 2007). Brander et al. (2007) find a limited number of empirical works exist on the value of coral reefs and believe the demand for more information about nonusers, values of nonuse, and the distance effects of these will continue to grow. Conservation efforts, for large ecosystems with complex boundaries and scales are likely to include local as well as distant groups of individuals and will probably be needing more knowledge about the preferences and values of these groups of people to a) create the right incentives, b) maximize revenue and c) provide better estimates of total value of coral reefs for decision-makers. As more and more environmental policies change from command-and-control and move towards market-like approaches, valuation of non market goods like coral reefs will be required to implement some of these environmental conservation approaches.

5.2. Resource Conservation and Valuation

In the case of coral reefs, these act like commons, rival and nonexclusive goods. These are prone to a tragedy of the commons, where collective use ultimately would lead

to the destruction of the ecosystem (Hardin, 1968). When there is a clear lack of exclusivity such as with commons, there is not a clear structure of property rights. When these are clear and established there is less opportunity for overexploitation. In the case of coral reefs, where access to them is difficult to restrict little incentive exists to conserve the resource. Many local communities have managed to design creative strategies for sustainable allocation of the ecosystem's goods. These strategies are neither purely market nor government-controlled management policies. These tend to be a mix of incentives in market-like settings and clear rules of governance as used by government agencies. Determining where the boundaries of a coral reef end and start of not easily defined. Sometimes privatization of common pool resources allows for property rights to be established, removing issues of boundary choice since these are set when private rights are created; this leads to exclusivity (Tientenberg, 2000), solving some of the free-rider problem facing commons depletion.

Managing the commons requires an understanding of the community of users, beneficiaries, and practitioners (Baden and Noonan, 1998). Many times commons are then provided by non-profits through donations. Fijian coral reefs benefit from both government regulation and non-profit assistance to keep the reefs in good health by decreasing local effects of overfishing, agriculture, and logging. Yet, these reefs continue to decline. Top-down approaches and command-and-control policies have not been successful for all types of environmental goods, particularly those like coral reefs. This is due in part to a failure of addressing the behavior of the individuals by not providing the right incentives.

One particular problem lies with larger fleet fishing, the larger externality affecting reefs not addressed by the government policies and local managers. This problem depletes fish stocks, thereby forcing local fishermen to exert larger pressure on reef fishing. Decline in larger fish populations leads to weakened reef food chains making them susceptible to algal blooms and predation. With a lack of clear prices for the benefits of coral reefs, actions affecting the reefs are not properly taking into account the full costs. In addition, undefined property rights allow for the presence of a "free" rider problem leading to a depletion of the resources. Problems with common pool resources, like coral reefs, arise from both externalities (costs of activities damaging reefs are not including full costs) as well as the innate characteristics of the type of resource (rival and nonexclusive good).

A continued decline in reef quality and quantity in Fiji has led many to believe the government policies previously adopted based on top down approaches are not working. In addition, a lack of resources to run effective conservation and management programs for reefs has led to continued decline. Non-profits sometimes along with local communities and government agencies, will work together to pool resources for monitoring and implementation of coral reef conservation. These can also create policies with rules about the boundaries of the resource, for management purposes. By creating clear boundaries and also deciding on clear property rights, free-rider issues can be addressed. To manage the reefs over long periods of time, reef value must be measured to help determine full costs of activities damaging to reefs (to address externalities) so that any negative effects can be mitigated or avoided (if costs are too high then some activities will decrease). Also, by learning if nonusers value reefs (how the amount of

value changes based on certain donor characteristics) nonprofits can expand stakeholders and those involved in reef protection. Non-profit-Government partnerships in developing countries with limited monetary funds could benefit from nonuse support, only if these can be identified. The support of traditionally exclueded nonusers located far from resources-far from reefs- may be in more than just monetary support; it may also be in participation of conservation movements, creation of new coral reef organizations, and other participatory roles.

A larger portion of donations to most non-profits comes from users, meaning those individuals who likely have done activities such as diving, ocean fishing, or ecotourism trips. Because of past experience, users are assumed to know more about the resources, and those individuals with more knowledge about the resource are assumed to also have higher values for it (Cameron and Englin, 1997). Knowledge about the environmental good comes from two sources, either the person has previous experience and knowledge from personal exposure (i.e. using the reefs or reading about them) or the person acquired information from the survey scenario (Cameron and Englin, 1997; Kniivila, 2006). More research has been done on information effects but less on use effects. Nonuser valuation is less understood for coral reefs, their values and what impacts their WTP (Kniivila, 2006).

Past research has suggested knowledge of the resource, either given on site during the CVM study or obtained in other ways, leads to more reliable WTP answers (Boyle et al., 1993; Diamond and Hausman, 1994; Whitehead et al., 1995; Kniivila, 2006). According to Whitehead et al. (1995), who differentiates between three types of respondents, on-site users (located next to the resource) and off-site users (not found near

the resource) are able to provide more precise WTP answers. Unlike users, non-users do not take budget constraints into account when stating their answers; this leads to assumptions about the validity of non-user value (Kniivila, 2006; Whitehead et al., 1995). Direct experience is believed to lead to well-defined preferences (Carson et al, 2001). Previous studies show non-experienced boaters to be more affected by question order (Boyle et al., 1993), and that direct knowledge of the good reduced hypothetical bias (Paradiso and Trisorio, 2001). There is likely to be a difference between the total value of non-users and users. However, less is understood about nonuse value differences between those with experience and those without, meaning the users and nonusers. Kniivila (2006) CVM study is one of the few to directly examine difference of nonuse values between users and nonusers. Most valuation studies access the value of nonuse from those groups of people whom have likely or assumed to have low nonuse value (i.e. divers and tourists) and have high use value. Nonusers potentially could have higher nonuse value, adding substantially to the total overall value of reefs, but these individuals are rarely included in WTP surveys of coral reefs. The exclusion of this group from valuation estimates of coral reefs maybe be underestimating the overall value of reefs (Kniivila, 2006), thus failing to include a potentially large source of revenue for nonprofits to better implement reef conservation.

Empirical research on the non-use value of coral reefs has been very limited. Chapters 1 discussed the types of studies to date on coral reef valuation highlighting the limited empirical work on non-use estimates. A study done by Horton et al. (2003) is one of the very few empirical studies looking at WTP of a good by individuals located far from the resource. They sampled individuals in the UK and Italy to asses WTP for

protected areas in the Amazon (Brazil). Their study found households on average WTP $45.60 per year to fund the conservation of a program protecting 5% of the Brazilian Amazon forest and slightly more ($59.28) if the program covered 20%. Although the researchers themselves express some concern about the validity and reliability of the results due to the distance to the good, the location of respondents might not be directly linked to nonuse value. Limited empirical work exists on location of respondent and WTP for coral reef conservation. Distance to reefs and knowledge about coral ecosystems might both be influencing nonuser values. Generally, nonusers are assumed to be located far from the good, and distance is then used as a proxy for familiarity/knowledge of the good. Kniivila's (2006) study would suggest there is validity in nonusers' WTP estimates located far from the environmental good even with a lack of direct familiarity with the good. Horton et al. (2003) suggest the total potential for revenue from UK households to be close to $912 million and similar for Italy. Their study like the Coral Reef Survey 2007 (Atlanta) asked participants about previous experience reading or seeing TV programs with content about the good (in their case tropical rainforests). In addition, their survey asked about threats to rainforests. Results from both the Horton et al. (2003) study as well as from this research suggest positive value (as expressed by monetary donations) by nonusers towards nonuse conservation of distant complex ecosystems.

5.3. The Potential Revenue of Non-Users: The Case of Atlanta Households' Value of Fiji Reefs

Data was taken from the "Coral Reef Survey 2007" described chapter 3. Using WTP estimates from survey responses a simple revenue curve was created. The WTP values were those individuals who said they would donate to the program and individuals who said they would not donate (includes both no donation due to budget constraint and also 'other' reason and given all a value of $0).

Depending on the goal of the non-profit, they can either set bids to be inclusive, allowing maximum participation, set bids to maximize revenue, or just allow the donor to set his or her price being both inclusive and profit maximizing. If the program is more interested in total donation amount and maximizing revenue, they could "sell" the donation program at a slightly higher price of $50.00 or even $100.00. Even though fewer people would donate these amounts, the overall total in revenue is greater (Table 29 and Figure 22). The organization might also set different prices for different groups of potential donors (effectively "price discriminating"), such as $X for wealthy donors and $Y for less wealthy donors. This is discussed in more detail in the following sections of this chapter where several market segmentation scenarios are presented.

When looking at the revenue curve, it increases at an increasing rate until revenue equals $1,100 or bid amount of $100. From this point and up to about $1,440, revenue increases at a decreasing and then decreases at an increasing rate. The Marginal Revenue (MR) is the change in total revenue from a change in quantity, or stated simply the additional revenue from change in quantity (Nicholson, 2002; Varian, 1992). The MR starts like the revenue curve increasing at an increasing rate, and when the bid amount

reaches $100 MR peaks and then begins to decrease at an increasing rate with a continued slow decrease. When the MR curve reaches bid amounts of $20 or less (WTP=$20 and lower), total revenues are as large as possible and any increase in the number of donations received will cause total revenue to fall (Nicholson, 2002).

Table 29. WTP by frequency and total potential donation amount for each donation group (WTP bid).

P (WTP Bid Amount $)	Q (frequency/donations received)	Market Aggregate (Total Demand)	Revenue	Total Revenue (aggregate)	Marginal Revenue	Marginal Cost
200	1	1	200	200	200	0
100	11	12	1100	1200	1000	0
50	16	28	800	1400	200	0
25	29	57	725	1425	25	0
20	15	72	300	1440	15	0
15	5	77	75	1155	-285	0
10	14	91	140	910	-245	0
5	8	99	40	495	-415	0
1	4	103	4	103	-392	0
0	141	244	0	0	-103	0

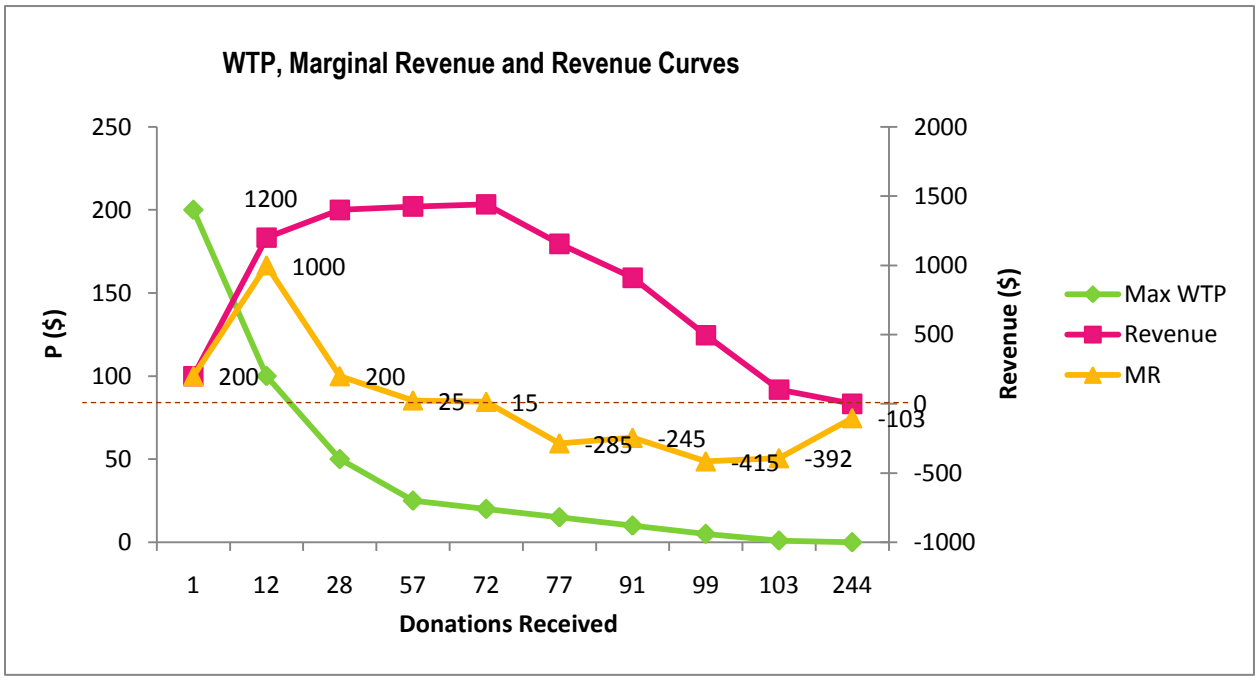


Figure 22. Donations received, price and revenue in WTP towards the Fijian conservation program.

When compared to other CVM work, the values found for Fijian conservation appear plausible. Casey (2006) conducts a CVM study on WTP by tourists (primarily American) for coral reef conservation. Although the studies differ in samples and location/coral reef, both the Mexico study (Casey, 2006) and this study on Fijian coral reefs show positive nonuse value. In the case of the Mexico study (Casey, 2006), charging $5.00 would yield largest number of donors but not the most revenue (Table 30). Of the comparable bid prices, for the Fiji study the bid price of $25 yields the maximum revenue ($1,142) whereas for Mexico the bid price is $50 ($2,300). Setting donation prices at $25-50.00 range appear to yield much higher estimates of revenue in both studies than at lower prices of $5-10.00. The Mexico study has larger estimated revenue and found higher WTP bids than the Fijian study. By number of donor per maximum WTP, a large number of donors would give $0.00 compared to any other bid amount.

Table 30. Distribution of donors by dollar amount (Max WTP) for the Atlanta Study compared to the Mexico study (Casey, 2006) with respective Revenue estimations. Note: for Mexico the presence of " – " in the frequency box denotes the bid amount was not an option in the study and thus not comparable to the Fiji Coral Reef Survey data.

	Frequency		Revenue	
Bid Amount/Max WTP	*Atlanta*	*Mexico*	*Atlanta*	*Mexico*
200	1	-	$ 200.00	$ -
100	11	15	$ 1,200.00	$ 1,500.00
50	16	31	$ 1,400.00	**$ 2,300.00**
25	29	44	**$ 1,425.00**	$ 2,250.00
20	15	-	$ 1,440.00	$ -
15	5	-	$ 1,155.00	$ -
10	14	55	$ 910.00	$ 1,450.00
5	8	72	$ 495.00	$ 1,085.00
1	4	-	$ 103.00	$ -
0	141	120	$ -	$ -

If going on the assumption individuals place higher value on what is in their backyard, or when located near the amenity, comparing the two studies could support this perspective. A future extension of this work is to survey on location in Fiji and compare to the results in Atlanta and determine whether the pattern seen here manifests-those closer to site and amenity place higher value on the good than those located far away. However, since the value of nonusers had not been determined in the past for Fijian coral reefs, it is unknown whether this assumption about distance to amenity would hold true.

5.4. A Practical Guide for Managers

International organizations such as the nonprofit Fijian group, will want useful and practical information to help create coral reef management strategies. Data and findings from this research can provide information about which prices lead to the maximum amount of revenue. In addition, the data can give insight on the possibility of a price discrimination scenario, where different groups are charged different prices in order to maximize profit. Assuming the manager could discriminate by price and thus segment his market based on information about their WTP and personal characteristics, various market segmentation options are provided as follows (Figures __ through ___):

- Size of Reef: 4 Miles versus 10 Miles
- Sample Group: General Public (mail survey) versus Georgia Master Gardeners
- Motivation: To Help the Environment versus Other
- Income: various income categories from $25,000 to $400,000
- Education: some high school, high school degree, some college, college degree
- Diver Certification
- Views of Coral Reef problems: consequences of coral reef degradation by group likely to be hurt the most

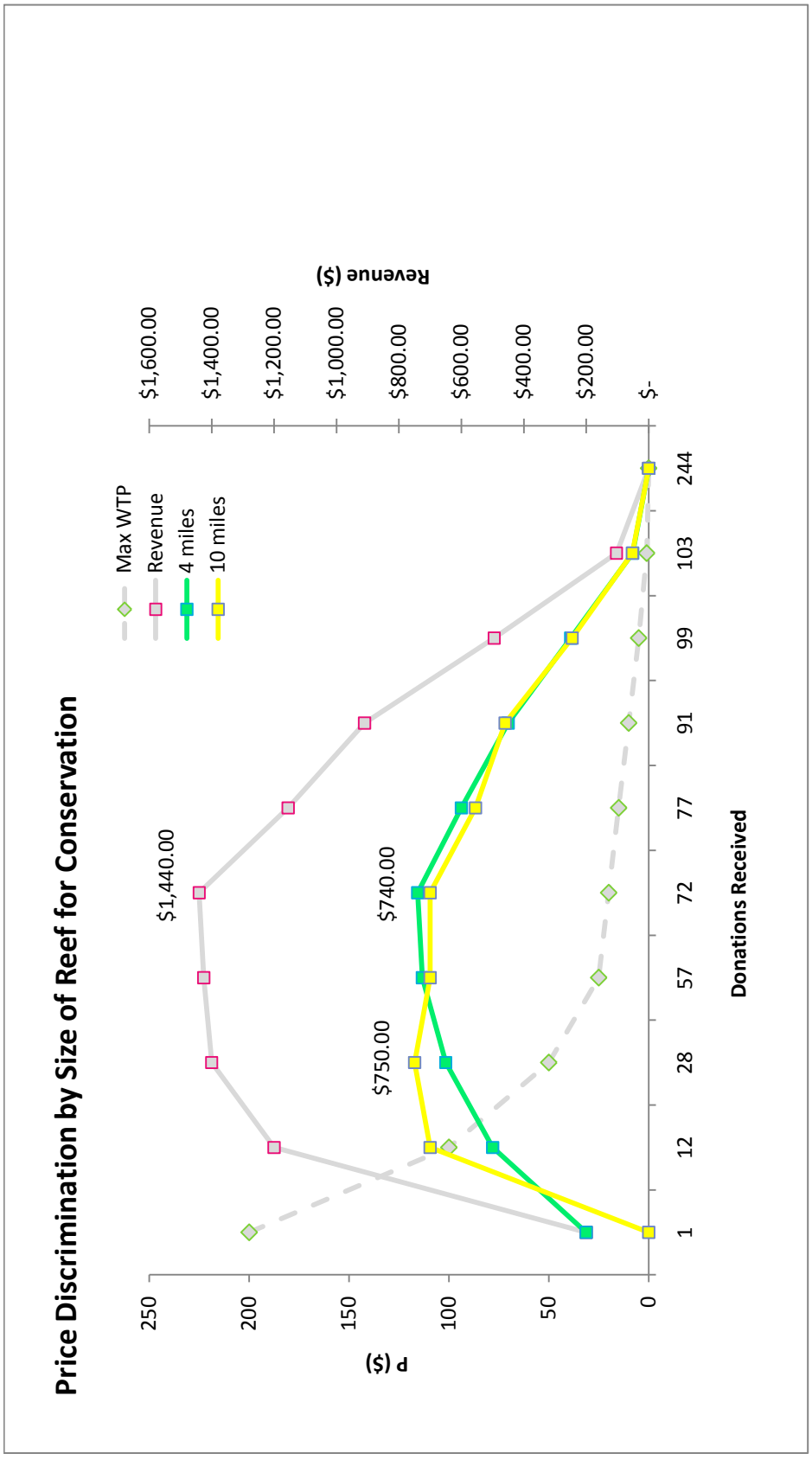


Figure 23. Market Segmentation by Size of Reef.

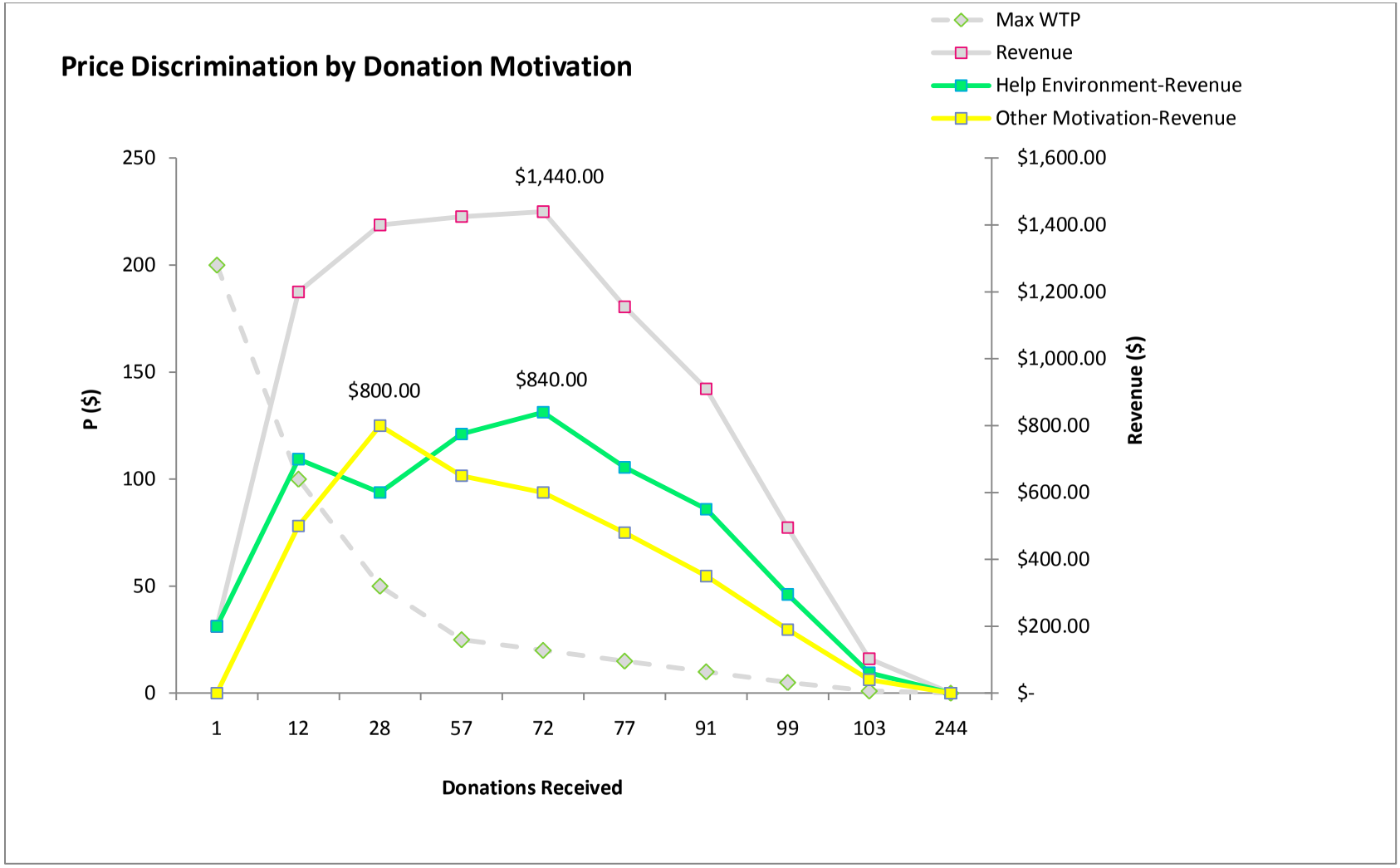


Figure 24. Market Segmentation by Motivation.

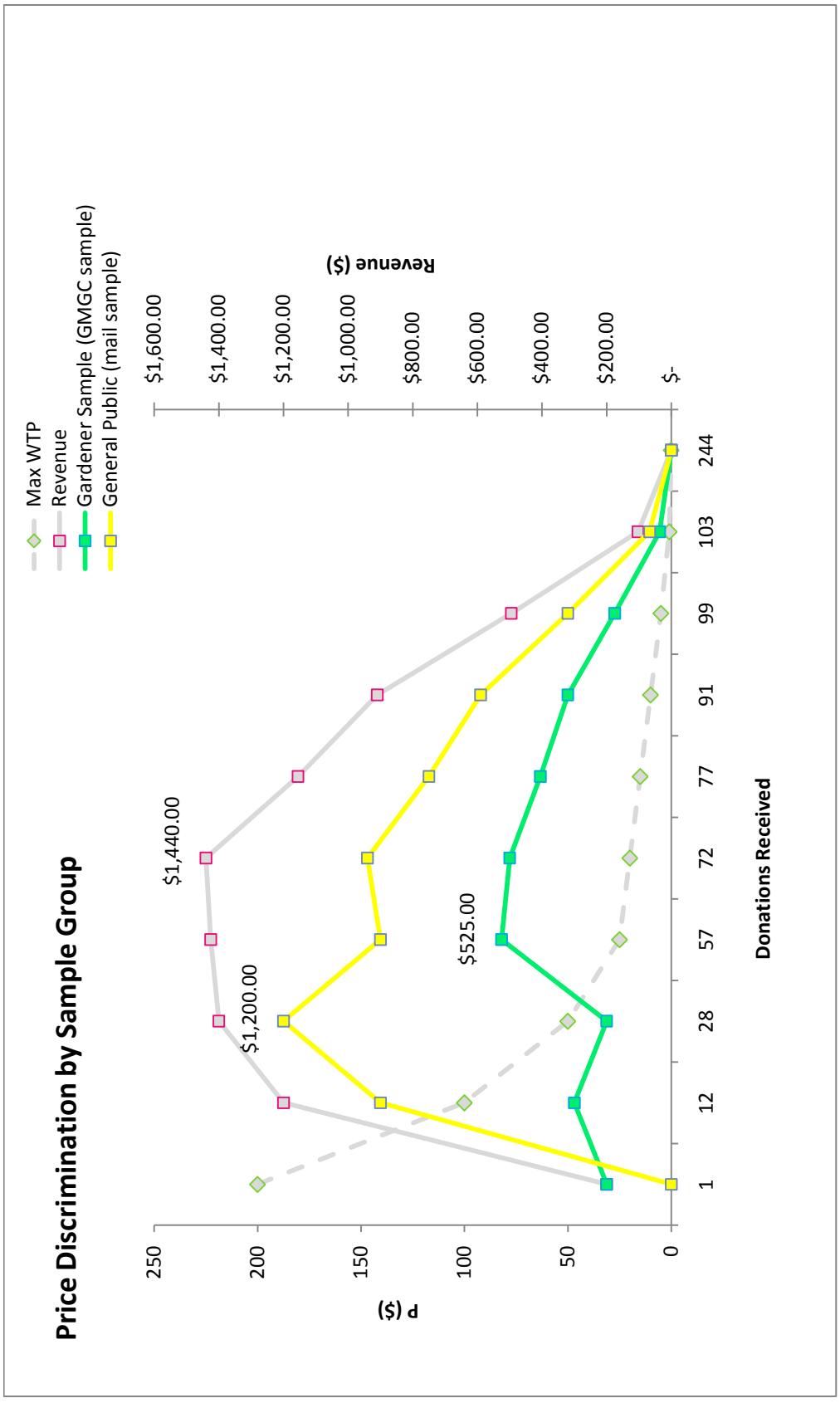


Figure 25. Market Segmentation by Sample Group.

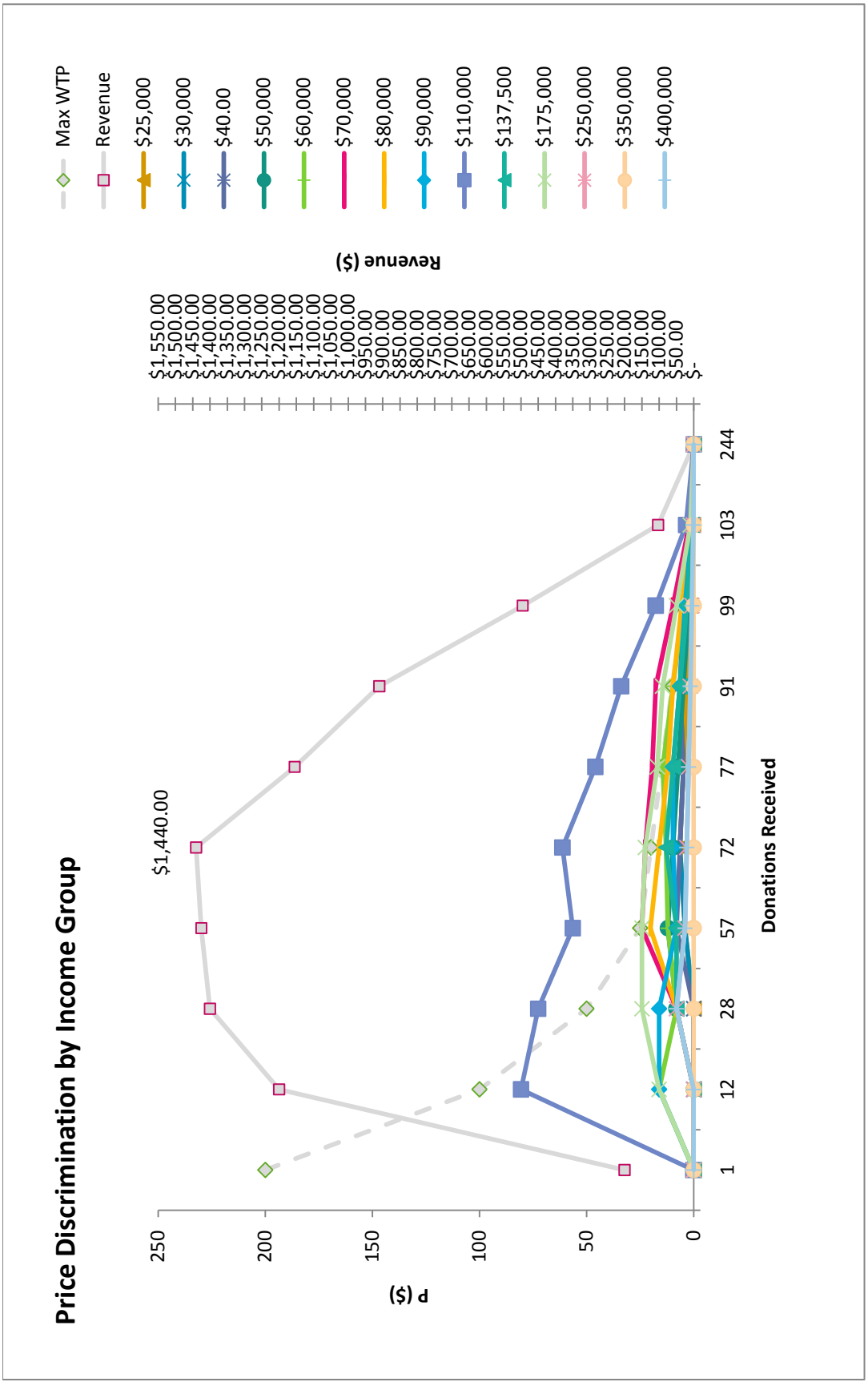


Figure 26. Market Segmentation by Income Levels.

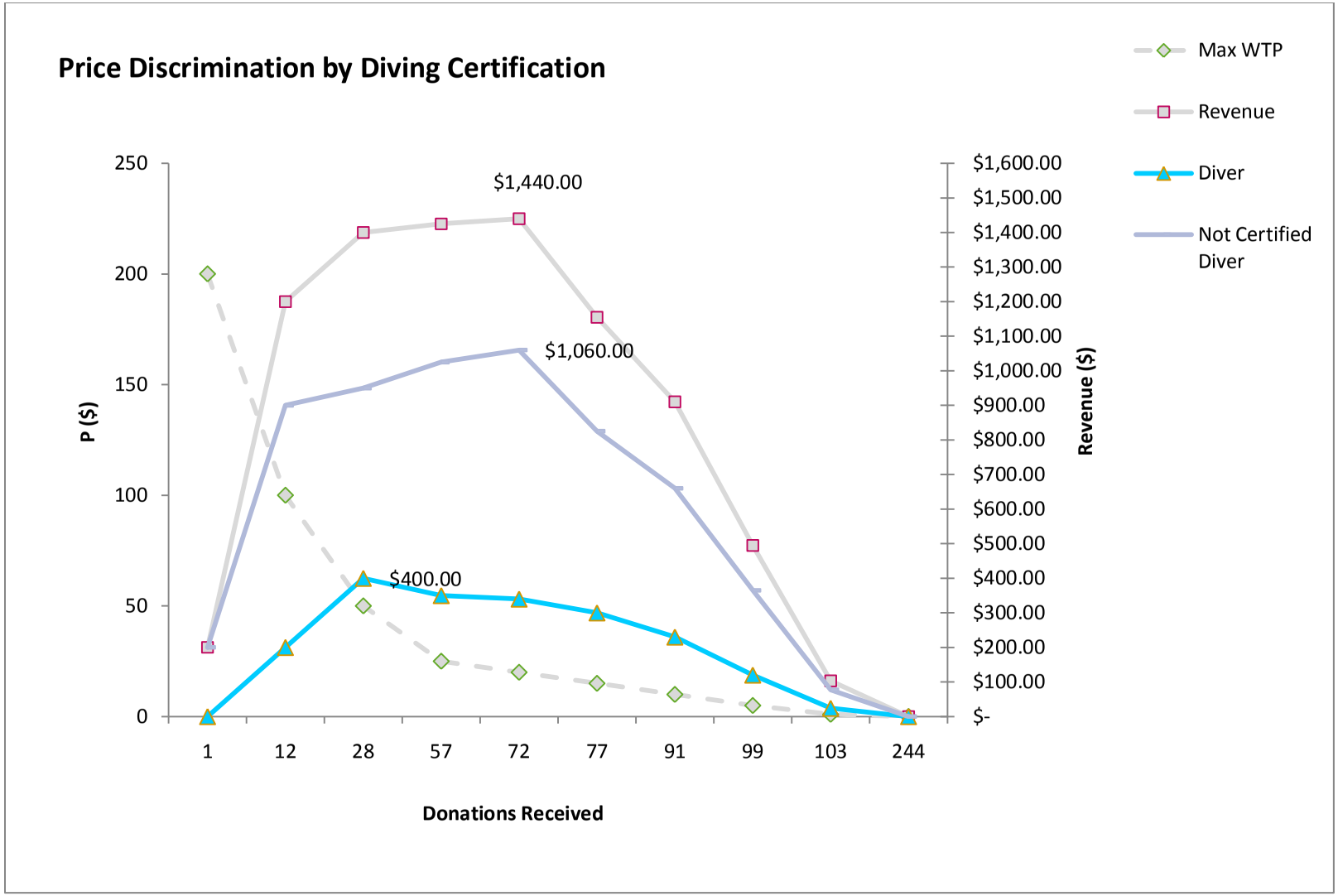


Figure 27. Market Segmentation by Diving Certification.

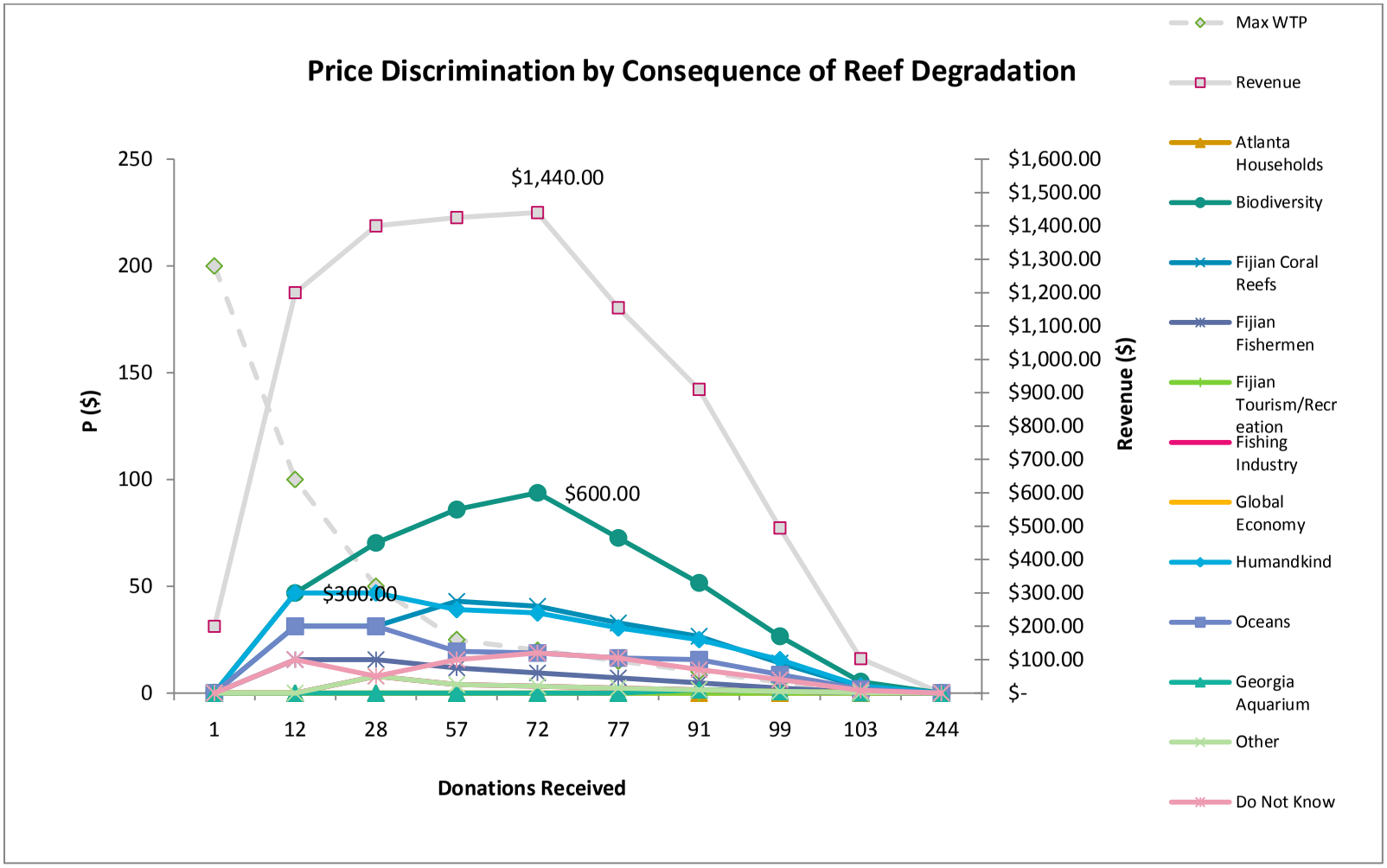


Figure 28. Market Segmentation by Type of Consequence of Coral Reef Degradation (Hurt the Most).

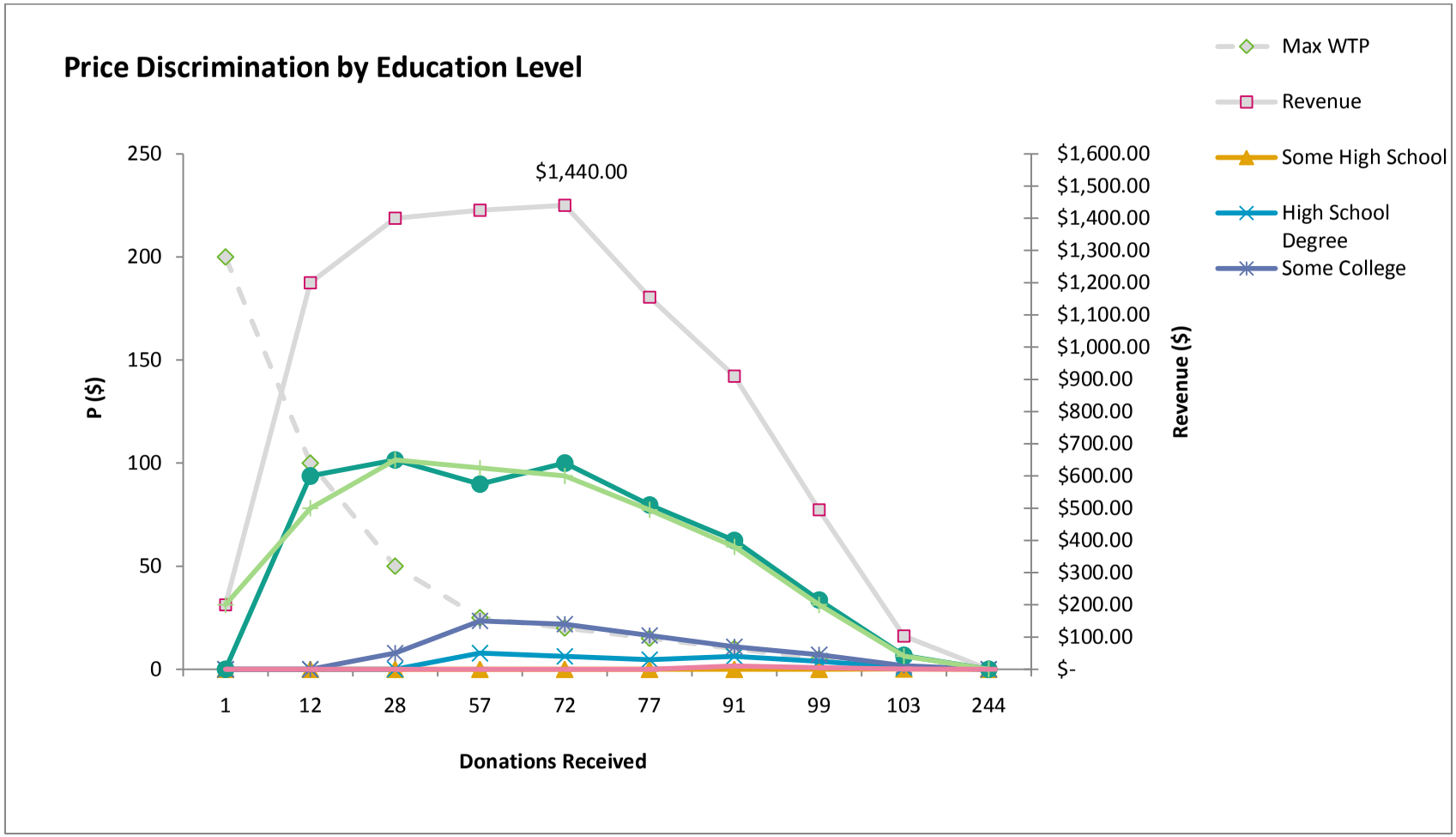


Figure 29. Market Segmentation by Education.

When looking at the options available to the manager for the nonprofit, knowing more about the donors can be useful to inform donation strategies to maximize revenue for the support of coral reef conservation. Contingent valuation surveys can assess how individuals living far from reefs value Fijian reefs and inform manager on what people value, motivations behind their values, and amount of value (WTP), in particular nonuse characteristics. If the manager were able to segment the market by motivation, the difference between those who donate to help the environment versus other reasons appears small ($840 versus $800), but the bid prices differ. Although total revenue is smaller for those with other motivations (i.e. future generations, helping a local community, tax deduction, and personal satisfaction) for donating to the Fijian coral reef program, they are willing to donate $50, $30 more than those with environmental motives. This suggests individuals donate for other reasons than protecting the environment. Previous research has shown individuals in many instance donate and make statements about what they would be WTP because it gives them a good feeling or believe is the "correct" thing to do (Nunes and Schokkaert, 2003; Dillman, 2007).

Looking at the summary of strategies (Table 31) and the detailed Table 32, segmenting the market by sample type appears to be the one providing the highest potential total revenue. The general public appears to donate more and with higher bids than those individuals related to garden and gardening practices. Although the mail sample is not generalizable to the larger population due to the small size, it does raise the question as to how the general public might differ, if at all, compared to specific groups of people. Perhaps the use of one single price bid could significantly reduce the amount of donations by nonusers. Divers might be assumed to be a group that would place high

value on reefs and their conservation; divers tend to pay high costs in travel and diving and thus likely value reefs more. Yet, when compared certified divers and non certified individuals from the sample the potential revenue was higher for the group with no certification. Again, the sample is not likely representative so it is not possible to know whether the difference is present or if this particular group of respondents are unique (i.e. outliers).

Table 31. Total potential revenues by conservation strategy.

Market	*Total Revenue*
Sample	$1,725
Consequences	$1,715
Motivation	$1,640
Education	$1,611
Income	$1,510
Reef Size	$1,490
Diving Certification	$1,460
No Segmentation	$1,440

Under the right conditions, managers might wish to segment the market and offer different donors different donation options. Several conditions are generally needed for price discrimination to be successful. First, there must be a barrier to resale or switching from one supplier to another, either as this action not being permissible or high transaction costs to dissuade resale (Nicholson, 2002). Second, the individuals must have

different price elasticity values where one group might be more inelastic than the other allowing the manager to charge different prices to different individuals. In a perfect price discrimination strategy, the nonprofit would act like a monopoly and would charge the maximum price the person would be willing to give. However, this would require the nonprofit to know a lot about their buyers/donors to be able to charge them their exact WTP, different likely for every buyer. A CVM can to some extent provide the nonprofit some of the information needed to know where price segmentation might be beneficial.

Table 32. Reef Conservation Strategies by market segmentation for revenue maximization.

Strategy			WTP Bid for Max Revenue ($)	Max Revenue ($)	Total Revenue ($)
No Market Segmentation			20	1,440	1,440
Segmented Market	Size of Reefs	4 Mile	20	740	1,490
		10 Miles	50	750	
	Motivation	Help the Environment	20	840	1,640
		Other	50	800	
	Sample Group	General Public (mail survey households)	50	1,200	1,725
		Gardeners (Georgia Master Gardeners)	25	525	
	Income	$ 25	20	40	1,510
		$ 30	20/10	40	
		$ 40	25	50	
		$ 50	25	75	
		$ 60	100	100	
		$ 70	25	150	
		$ 80	25	125	
		$ 90	100/50	100	
		$ 110	100	500	
		$ 138	20	80	
		$ 175	50/25	150	
		$ 250	50	50	
		$ 350	0	0	
		$ 400	50	50	
	Diving Certification	Diver	50	400	1,460
		Non-Diver	20	1,060	
	Education	Some High School	1	1	1,611
		High School Degree	25	150	
		Some College	25	150	
		College Degree	50	650	

Cont. Table 32.

		Graduate/Professional Degree	50	650	
		Other	10	10	
	Consequences of Coral Reef Decline-"Who would be hurt the most"	Atlanta Households	0	0	1,715
		Biodiversity	20	600	
		Fijian Coral Reefs	25	275	
		Fijian Fishermen	100/50	100	
		Fijian Tourism/Recreation	0	0	
		Fishing Industry	50	50	
		Global Economy	10	10	
		Humankind	100/50	300	
		Oceans	100/50	200	
		Georgia Aquarium	10	10	
		Other	50	50	
		Do Not Know	20	120	
		Atlanta Households	0	0	

5.5. Implications

There are markets associated with coral reefs and these are usually dominated by fishing and recreation/tourist interests (Spurgeon, 1992). The actors in those markets have a stake in conserving the reef ecosystems. Still, the full value of the reef ecosystems is not going to be captured by those reef users if (a) property rights are incomplete, or (b) there are nonuse or public goods values at stake in reef conservation. There may be other stakeholders who value nonuse qualities of reefs, and these players are rarely included in valuation analysis of reefs. Non-profits such as *Sasalu Tawamudu Fiji* are interested in maximizing revenue and locating individuals with nonuse value to increase the donors. This chapter presented several market segmentation strategies that this nonprofit could use in order or maximize revenue. The data collected using the Coral Reef survey suggests more potential revenue exists with a price discrimination approach then without one. Viewing Table 31, when the market is segmented by sample (mail survey sample versus Gardener sample), view of coral reef problem ("who would be hurt the most with the decline of coral reefs?"), and donation motivation yield the higher revenue values when compared to the other segmentation strategies ($1,725, $1,715 and $1,640 respectively). However, these segmentation approaches would require somewhat information-intensive data about the donor to determining what price to charge them. First, the nonprofit would have to know whether the individual belongs to a gardening club or who is generally motivated to donate towards environmental issues. Second, the nonprofit would require knowledge about the person's perception of coral reef impacts and consequences. Those with larger views of coral reef problems who would find biodiversity, oceans or humankind affected by changes in coral reef health might be

likely to pay more and should then be given the opportunity to donate larger amounts and not be limited to one price.

Price discrimination via income and education levels also has the potential to yield larger revenue amounts. Those with higher income or those with college and graduate/professional degrees are WTP higher amounts and could theoretically remove the burden of conservation for disadvantage groups unable to provide monetary support. This would suggest developing countries could benefit by including richer more educated nations to participate in programs working on coral reef health and management. This strategy seems more plausible because less information is required by the nonprofit about which donor to target; developing versus developed countries are general knowledge and thus Fiji could include Americans and Europeans to donate.

Although it may be assumed that divers are more likely to donate and pay higher prices for coral reefs, the data found the opposite. The sample was 85% non diver certified yet this group had higher bids and revenue than the diver group. The divers were a very small percentage of the sample but representative of the larger US population. About 12% of the US population has a diver certification. Therefore the findings would suggest nonprofits should not only focus on getting donations from divers, but from the larger non-diving non-coral reef using population. For the most part, coral reef groups focus their efforts on location. The data implies support for the inclusion of donors with what would seem like less reef exposure since these individuals appear to value reefs and have a potential for contributing higher revenue than divers. The inclusion of non divers could increase the funds needed to manage over a longer periods of time and larger coral reef areas.

This paper focused on alternative approaches to coral reef conservation. Mobilizing the interests of nonusers and of those not typically party to market transactions (concerning coral reefs) becomes a major policy aim. Although nonmarket valuation techniques such as CVM can serve to help measure those existing values – informing who those stakeholders are and how they value conservation projects – it does not address the market failure where those values are not expressed or represented in the market.

Findings from this work highlight two important issues rarely discussed in the policy literature: 1-the use of non-market valuation methods to identify stakeholders and 2-the effects of distance on use and non-use value ultimately impacting coral reef estimates of conservation revenue particular nonuse stakeholders. Determining the location and type of stakeholders for environmental policy has always been difficult and few solutions to this problem have been suggested. Currently, many of the conservation policies are adopting market-based tools and these market-like solutions generally require information about the value of the good. Assessing the value of a natural resource such as coral reefs is a difficult problem because of the complexity of the system (Bateman et al., 2008; Brander et al., 2007; Norton and Noonan, 2007; Costanza et al., 1997; Mitchell and Carson, 1989). An ecosystem cannot easily be divided into parts and each sold separately without collapsing the reef. To begin with, individuals place value on non-tangibles like the mere presence of coral reefs (people think coral reefs are beautiful). How can the value of "beautiful" be measured? Secondly, many environmental resources are connected or attached to a system not easily divided into parts. Finally, coral reefs like many ecosystems do not have a market, at least not with clear prices. The

application of market-based tools for the management of natural resources is an increasing trend. This is in part due to the failure command-and-control policy tools, where in some cases incentives to conserve are perverse (Stavins, 2001). Another reason for the change towards market-like solutions relates to the need of having more flexible policies able to adjust faster to changes in consumer preferences, environmental shocks, and transboundary issues (Stavins, 2001). Some of these market-based tools for environmental management include privatization of public goods, compensation for damages, and trading policies. Yet, the implications and consequences (success/failure) of these new approaches are still being reviewed (Beck et al., 2004; Spurgeon, 2001).

If environmental conservation was approached using market tools, the rights to coral reef ecosystems and spillovers from activities using the reefs could be defined, legally defensible at low costs, and transferrable. The rights to a preserved or conserved coral reef, then, could be traded in a market setting and, conceivably at least, distant nonusers could exercise their interests and compete with others in determining the fate of reefs.

5.6. Tips for Managers: Guidelines for implementing a successful CVM study

In large, research supports the use of CVM to assess environmental values. Some critics of CVM suggest new approaches via multi-criteria such as Deliberative Monetary Valuation (DMV) lead to better estimation monetary value of environmental goods (Spash, 2007). The DVM method is still in its early stages and thus has not been tested empirically as thoroughly as CVM. Others advocate more comprehensive methods to

assess value so as to include CVM as one of a variety of methods able to embody plural values (Norton and Noonan, 2007).

For now, CVM remains the 'best' method to estimate non-use values. Recent work on CVM has proposed changes to the method to improve validity and reliability (reduce hypothetical bias and cheap talk). Bateman et al. (2008) discuss the Learning Design Contingent Valuation (LDCV). Brander et al. (2007) discuss the use of spatial variation in coral reef studies and discrete choice experiments both of which improve CVM findings. These researchers also go on to even suggest the need to create standard protocols for reporting reef valuation results requiring higher quality of work. A recent suggestion by Fischer and Hanley (2007) is to incorporate along with the CVM survey a typology similar to the ones used in consumer psychology (most useful during design stages) to help identify responses on preferences for the good, that can later be compared with WTP answers.

Granted, contingent valuation research continues to struggle around hypothetical bias, cheap talk and survey design. Yet, the novelty of CVM lies in its ability to be incorporated into many management strategies producing useful information for practitioners, if CVM is applied correctly. Many of the criticisms of CVM work lies not so much in the method itself but in the poor implementation and design of the study leading to unreliable data. Thus, to hopefully improve future CVM work and point out areas for pitfall and bias, the following guidelines were created. Early CVM research was focused on estimation of non-use values, later the work focused on testing the validity of the method, and currently the experts are trying to understand the ways in addressing the weaknesses to improve data quality. CVM research has crossed into fields

no longer found strictly in the environment economics arena. There are many obstacles that CVM researchers face. The strength of the data and thus research is linked directly to the quality of information collected; this means having a survey with precautions to avoid biased responses. As a recent scholar, Dr. John Dixon, stated "The good point about CVM is the same as the bad point-you always get an answer!" (Dixon, 2008).

5.7. Conclusions

Contingent valuation is an accepted method of measuring use and non-use value for environmental goods, but the full potential of this method has not been explored. This study suggests CVM might help policy makers and practitioners identify not just value but location of the value of coral reefs. Using CVM data managers can determine possible markets and either use single prices or price discriminate based on their revenue goals. Developing countries with limited resources such as Fiji may benefit by including previously excluded participants in conservation programs. From the perspective of a nonprofit seeking charitable donations (to support its efforts to protect coral reefs), such a demand curve can inform the design of donation-maximizing solicitations. The CVM scenario asks a hypothetical donation to a hypothetical conservation program, and the nonprofit that *actually* carries out such programs could use the survey responses to improve their fundraising efforts.

APPENDIX

APPENDIX A: Survey Sampling Protocol for Metro Atlanta[1]

Although originally the dissertation purchased a sample of 4000 households, budget has caused the study to halve this number. The sample size used was 2000 households. The sample came in four files. GA 1 has the major 4 counties and GA 2 has the smaller counties. GA1_A is the Hispanic oversample of 150 records. GA1_AA is the African-American oversample of 250 records. There are a total of 4000 household addresses and phone numbers. SDR sampled by county at the block level group in three tier income levels. The counties were as follows: Fulton, Cobb, DeKalb, Gwinnett, Spalding, Newton, Coweta, and Cherokee.

How will the sample be halved?
Each address will be given a random ID number (using Stata) by file. All the odd numbers will make up 1 file and the even numbers another file. Only one file will be used for the mail survey. This will be done to all 4 excel sample files. Once they have all been split, these will then be joined into one large file and given a new random ID number. This number will be used as identification for mailing and data entry. The ID will be placed at the back of each survey.

Survey A versus Survey B
CVM studies general have a scope test and or sensitivity test for the survey. Due to budget constraints (since each split is a printing order increasing costs), there will be only one split. Survey A and Survey B will be identical except for changes in the quantification of the coral reef improvement being sold. For the first wave of 2000 total surveys, 1000 will be A and 1000 will be B. Assignment of survey A or B to each address will be randomly done either by selecting every other survey for each version or just splitting the sample in half (since the ID have already been given randomly to each address the order remains random).

For 4000 (original)
Suggested complete sample size is 1,066 for a 95% CI with a sampling error ±3% (general acceptable mail surveys-Dillman) for a heterogeneous population of about 500,000 or more. When looking at CVM studies, samples and response rates vary greatly. Mitchell and Carson provide tables with suggested sample size by type I and II errors. They suggest CVM studies set $\alpha = 0.10$ and $\beta = 0.10$ or 0.20 to get completed usable WTP samples (smaller values tend to be too expensive for most researchers). These tables assume the study knows the coefficient of variation ($V=S_p/X_1$), and percentage difference. Mitchell and Carson find V for CVM studies range between 1.0-3.0; they recommend using V=2.0, a conservative assumption of the value for V. If this study assumes $\alpha = 0.10$ and $\beta = 0.20$ with V=2.0 to detect a 2% difference rate, the sample size would be 1,714 (two-tailed) or 902 (one-tailed). Using guidelines provided by both Dillman and Mitchell and Carson, this study suggests a final complete sample around **1,500**. If a conservative response rate of 30% is set, then **5,000** households would need to be sent the initial survey. These numbers allow for incomplete cases. Thus, the study would be 95% confident that the results from the 1,500 would be the same as the population plus or minus a 3% sampling error. Assuming Mitchell and Carson settings for $\alpha = 0.10$ and $\beta = 0.20$. Therefore, there is a 10% chance of committing a Type I Error-rejecting the null

[1] The protocol was built based on instructions from Dillman (2007) and also suggestions from Mitchell and Carson (1989)

hypothesis (no significant difference in WTP figures between poor and non-poor or between minorities and non-minorities or between people who know a lot about coral reefs and those who don't etc.) when it is true.

For 2000 (revised and current)
According to Mitchell and Carson (1989) suggested complete sample size is 568 for a 95% CI with $\alpha = 0.20$ and $\beta = 0.20$ for a one-tailed t-Test. If a smaller V is assumed a smaller sample is needed, because it would mean the population is more homogenous. When a group is similar fewer observations are needed to make statements about the group. If a 30% response rate is assumed (somewhat ambitious) which is 600 final surveys (out of 2000), this number meets the above Mitchell and Carson requirements. The major difference between the 4000 and this 2000 sample size is due to the $\alpha = 0.20$ being set at a higher level. Now there would be a 20% chance of committing a Type I error-rejecting the null when the null is true. Also, this is for a one tailed t-Test. For a two-tailed t-Test the final sample would have to be much larger, 1,316 surveys.

Survey Population: All occupied household addresses for Census CMSA Atlanta GA (Spalding, Fayette, Coweta, Newton, Gwinnett, DeKalb, Fulton, Cherokee, Cobb,)

Sample Frame: SDR List (occupied household addresses for the CMSA Atlanta updated quarterly I believe)

Sample: 4,000 occupied household addresses with phone numbers (stratified sample by income by county to assure the sample can say something about minority behavior-income, race)

Estimated Completed Sample: 600 surveys (assuming an initial sample of 2000 households with a 30% response rate)

Coverage Error: addresses (excludes migrant workers who live in large farm houses, or homeless people, or with similar situation), phones (5.5% of households do not have a landline phone)

Sampling Error: 3%

Respondent Selection: household person to answer the survey
Previous research has suggested including instructions on the survey or cover letter as to who should answer the questions. This is done to increase the number of female respondents, since men are more likely to answer mail survey and women telephone survey.[2] Since my research is not interested in household behavior (who answers and who doesn't) but more interested in having a population representative number of males and females. Research suggests the following: "In order for the results of this survey to accurately represent all adults in the Metro Atlanta Area, it is important the questionnaire enclosed be completed by the adult (18 years or older) who now lives there and has had the most recent birthday".

[2] Dillman (2007) page 203

APPENDIX B: IRB Form Georgia Institute of Technology

Georgia Institute of Technology

Office of Research Compliance
Atlanta, Georgia 30332-0420 U.S.A.
PHONE 404•894•6944
FAX 404•385•2081
irb@gatech.edu
iacuc@gatech.edu

June 11, 2007

Ms. Carolyn Fonseca
Georgia Institute of Technology

Dear Ms. Fonseca:

The Office of Research Compliance has carefully considered your proposed work and has determined that an Institutional Review Board approval is not required at this time.

We understand that you will be pre-testing your survey for readability. No information collected from this pretest will be used in any publications.

Your efforts in ensuring compliance with the regulations and policies governing human subjects research are appreciated. If you have any questions regarding this response or about the regulations governing human subject activities, please feel free to contact me at 404/894-6949, or you may contact Dr. Phillip Sparling, IRB Chair, at 404/894-3402.

Sincerely,

Melanie J Clark
Compliance Officer
Office of Research Compliance

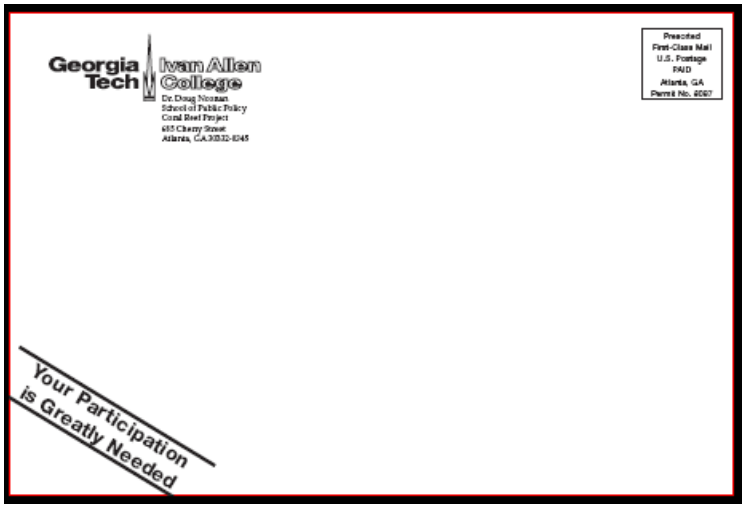
cc: Dr. Phillip Sparling, IRB Chair

APPENDIX C: Outgoing and Reply Envelopes

Outgoing Envelope

Reply Envelope

Outgoing Envelope 3rd Wave Mailing



APPENDIX D: Cover Letters

1st Wave Mailing

November 9, 2007

Dear Participant,

We invite you to participate in our study!

Your views and perceptions on the environment are very important to our research at the *School of Public Policy at the Georgia Institute of Technology*.

As a way to thank those who take our survey, we will be randomly selecting one winner for a grand prize of *$500.00*.

Specifically, our team is interested in **Atlanta household** opinions on **environmental issues**. There is very limited knowledge on environmental values for Atlanta. Your views are important for making fair environmental policy decisions. The quality of our results will be greatly enhanced by having everyone who gets the survey to respond and return it to us. Please share with us your opinions.

Taking the survey is easy. There are no right or wrong answers. Simply select one adult (18 years or older) from your household to fill out the survey. The survey takes about 15 minutes to complete, and when finished fold and place it in the included "no-postage required" return envelope. Seal the envelope and mail.

Any information you provide will be kept completely confidential. Any personal information will be removed from the data so as to keep your participation anonymous. The information you share with us is strictly for *educational purposes*. No information will ever to go a solicitor or third party.

Your participation is voluntary. You may skip any questions you do not wish to answer.

If you have any questions about the study or participation, please feel free to contact Carolyn Fonseca (404-385-3487 or e-mail *coralreef@pubpolicy.gatech.edu*). If you have additional questions about confidentiality, please contact Ms. Melanie Clark (404-894-6944 or e-mail *melanie.clark@osp.gatech.edu*).

Thank you for your participation!

Please visit our webpage **http://www.spp.gatech.edu/coralreefvaluation** for further information and results regarding the study, or call us at **(404) 385-3487**.

Sincerely,

Carolyn Fonseca-PhD Candidate
Co-Principal Investigator

Dr. Doug Noonan
Principal Investigator

Atlanta, Georgia 30332-0345 U.S.A.
PHONE 404.385.3487
FAX 404.385.0504

2nd Wave Mailing

December 14, 2007

Dear Participant,

We invite you to participate in our study! We need you!

To show our thanks, you will have a chance to win the grand prize of *$500.00*. You are eligible to win even if you do not participate. For details, see our webpage.

The quality of our results will be greatly enhanced by having everyone who gets the survey respond and return it to us. Please share your opinions with us. Your views and perceptions on the environment are very important to our research at the *School of Public Policy at the Georgia Institute of Technology*.

Specifically, our team is interested in **Atlanta household** opinions on **environmental issues**. There is very limited knowledge on environmental values for Atlanta. Your views are important for making fair environmental policy decisions.

Taking the survey is easy. There are no right or wrong answers. Simply select one adult (18 years or older) from your household to fill out the survey. The survey takes about 10-15 minutes to complete. When finished, fold and place it in the included "no-postage required" return envelope. Seal the envelope and mail.

Any information you provide will be kept completely confidential. Addresses and names will only be used for the prize drawing, and not included in the data. The information you share with us is strictly for *educational purposes*. No information will ever to go a solicitor or third party.

Your participation is voluntary. You may skip any questions you do not wish to answer.

If you have any questions about the study or participation, please feel free to contact Carolyn Fonseca (404-385-3487 or e-mail *coralreef@pubpolicy.gatech.edu*). If you have additional questions about confidentiality, please contact Ms. Melanie Clark (404-894-6944 or e-mail *melanie.clark@osp.gatech.edu*).

Thank you for your participation!

Please visit our webpage **http://www.spp.gatech.edu/coralreefvaluation** for further information and results regarding the study, or call us at **(404) 385-3487**.

Sincerely,

Carolyn Fonseca-PhD Candidate	Dr. Doug Noonan
Co-Principal Investigator	Principal Investigator

3rd Wave Mailing

Georgia Tech Ivan Allen College
School of Public Policy

January 29, 2008

Dear Participant,

We invite you to participate in our study! We need you!
If you have already sent in your survey THANK YOU and we hope you win the prize!

If you received this letter you have a chance to win the grand prize of *$500.00*.
You are eligible to win even if you do not participate. For details, see our webpage.

> Answering the survey takes about 10 minutes. Returning the survey is free – simply use the enclosed pre-paid envelope.

Please share your opinions with us. ***The quality of our research at the School of Public Policy at the Georgia Institute of Technology depends on you completing the survey.*** Your participation is voluntary and any adult over 18years of age living in the household can complete the survey.

Specifically, our team is interested in **Atlanta household** opinions on **environmental issues**. Your views are important for making fair environmental policy decisions. *Any information you provide will be kept completely confidential*. Addresses and names will only be used for the prize drawing, and not included in the data. The information you share with us is strictly for *educational purposes*. No information will ever to go a solicitor or third party.

If you have any questions about the study or participation, please feel free to contact Carolyn Fonseca (404-385-3487 or e-mail *coralreef@pubpolicy.gatech.edu*). If you have additional questions about confidentiality, please contact Ms. Melanie Clark (404-894-6944 or e-mail *melanie.clark@osp.gatech.edu*).

Thank you for your participation!

Sincerely,

Carolyn Fonseca-PhD Candidate Co-Principal Investigator	Dr. Doug Noonan Principal Investigator

http://www.spp.gatech.edu/coralreefvaluation **(404) 385-3487**

Atlanta, Georgia 30332-0345 U.S.A.
PHONE 404.385.3487
FAX 404.385.0504

APPENDIX E: Protocol for Focus Groups

Focus Group Protocol

Focus Group:	Book Club
Number Invited:	10 Adults
Location:	Flint River Regional Library System, Griffin GA
Time:	3:30-4:30pm
Date:	Monday July 9, 2007

Outline of Activities

1. Introductions
    a. Please fill out a name tag
    b. There is a sign in sheet…it would be great if you would sign in
    c. Me
    d. You

2. Reasons for being here and how your help will help me
    a. Describe project dissertation
    b. Describe survey research
    c. How you will help me

3. Outline of how we spend out time

4. Evaluation and Comments (what did you think about the focus group)

5. Prizes

Ground Rules

For them:

- This is completely voluntary and you can stop at anytime
- There are no right or wrong answers
- This is a safe environment for opinions and views
- Please feel free to share your ideas and opinions
- I am interested in negative comments as well as positive comments
- Do not feel like you have to agree with any of the comments

- Give others a chance to participate
- In focus groups, all comments are valid and valuable
- In focus groups, some people talk more and some talk less, to make sure I get your data and ask that those who feel they might talk less they try to give me their opinions so that your view is part of my data
- This is a team effort
- Your opinion not be logical
- You do not need to justify your answer, it is your opinion

For me:

- Think and pause about what has been said
- Do not use the word "WHY" like in "why did you go to the aquarium", instead say something like "what parts of the aquarium seemed attractive to you"
- PAUSE
- PROBE
    - Can you explain further
    - Tell us more
    - Please describe what you mean

Materials:

- Recorder
- Name tags/table name signs
- Handouts
- Pens
- Paper
- Easel/Sticky Large Pad for notes

List of Names and E-mails (voluntary and used only to send you a Thank You)

Name	**E-mail**
Example: Carolyn Fonseca	carolyn.fonseca@gatech.edu

Discussion Topics/Themes

How they think or feel about:

- **Sense of Place**
  - When you hear the word "ENVIRONMENT" what comes first to your mind? (try to figure out if its their backyard, planet earth, take care to note the vocabulary they use
    - Describe the things in your environment
  - What do you like about your environment?
  - Have you traveled a lot?
  - How much do you think you would need to travel to feel a sense of place of a particular place?
    - do you need to travel to a location to care for it, or would just knowing about it be enough? FEEL vs. READ about something to care
- **Charity Contributions**
  - What kind of charity would you donate money to?
  - What about their cause would make your more likely to give money?
  - If something is very far away, would you give money?
  - Would it make a difference if your contribution was run by a US organization or an NGO?
  - What environmental issues are important to you?
  - If MTV, VH1, MySpace, or something similar was to ask for donations for a conservation project, would that make you more likely to give money?
  - Would you rather give money or time/
- **Information and its effect on Valuation**
  - What kind of information would make something credible, for example ("what if I told you that recycling is bad for the environment, it destroys forests, would you be more for it of less for it?"):
    - Newspaper
    - ipod cast
    - internet
    - parents
    - teacher
    - politician
    - movie star
  - Do you believe what you read?
  - What sources are credible sources of information, who do you believe?
  - If you know more information about something do you think this would affect your behavior?
  - Would you be more likely to care more for something if you knew about it?
  - If the information is against what you know or believe, how do you change your view, meaning do you need to feel it, hear it from someone specific?
- **Causes of Coral Reef degradation**
  - What do you think about the ocean?
  - Do you feel your behaviors here in Griffin impact ocean ecosystems?
  - Which ones, what types of behaviors do you believe are positive or negative for the marine environment?
  - What do you know about coral reefs?
- **Impacts of Coral Reef degradation**
  - Do you think eating fish here in Griffin has a negative or positive effect on people who live very far away from Griffin (please tell me what you think as far away)
  - DO you care more about local issues or global issues?

- Which global issues do you think about?

Specific Questions

SCENARIO

- Please read the following scenario, is this scenario realistic? Is it too much information? Is it not enough information?
- Would it make difference if there was a map?
- How much money would you donate towards this program?
- What aspects about the program did you like?
- What do you think you were giving money towards? (looking at use and non-use)
- Would it make a difference in your answer if I had mentioned early on that people cheat and lie, if I had stated this before, would you be more likely to respond truthfully
- How will your contribution matter? (what kind of effect would your contribution have)
- Why would not contribute?

SURVEY

- How would you improve the survey layout?
- How you would make the survey more clear?
- What words or questions seem unclear?
- What questions were missing that you would have liked to have seen?

OTHER

- What kind of animal movies have you seen?

APPENDIX F: Expert Review

Survey Sample

Total Number of Experts for Survey Review (sample from which review was requested)	70
Mailed (has accepted review)	40
Dropped	16
Declined	2
Reviews received	15

Experts

Prefix	Name
Dr.	Laura Taylor
Dr.	John C. Whitehead
Dr.	Bob Leeworthy
Dr.	Pieter J. van Beukering
Dr.	J. Mike Bowker
Dr.	John B. Loomis
Ms.	Zeinab M. Ngazy
Mr.	Thomas Graham
Dr.	George R. Parsons
Ms.	Narriman Saleh Jiddawi
Dr.	Timothy A. Park
Dr.	Alan Randall
	H. Jack Ruitenbeek
Dr.	Paolo Nunes
Dr.	Steven M. Thur
Dr.	Venetia Hargreaves-Allen
Dr.	Robert Cameron Mitchell
Dr.	A. Myrick Freeman III
Dr.	Richard T. Carson
Dr.	Tim Haab
Dr.	Raymond J. Kopp
Dr.	Erik Schokkaert
Dr.	W. Michael Hanemann
Dr.	Herman Cesar
Dr.	Don Dillman
Dr.	Patricia A. Champ
Dr.	Hank Jenkins-Smith
Dr.	Carol L. Silva
Dr.	Don L. Coursey

	Tijen Arin
	Randall A. Kramer
Dr.	James Spurgeon
	Udomsak Seenprachawong
Dr.	John C. Bergstrom
Dr.	Baruch Fischhoff
Dr.	Ian Bateman
Dr.	Kevin J. Boyle
	Bee Hong Yeo
	Chiew Kieok Chong
Dr.	Kent Gustavson
	Kristin Sherwood
Dr.	Robert Mendelsohn
Dr.	Shahrul Anuar Mohd Sah
Dr.	Nick Hanley
	AKM Mahfuzuddin Ahmed
	Mohammad Kasim Moosa
	Noah Idechong
	Richard M. Huber
Dr.	Robert N. Stavins
Dr.	Clive L. Spash
Dr.	Jessica Andersson
	Khanh Mam Pham
	Tanya O'Garra
	Ahyaudin B. Ali
	Anugerah Nontji
Dr.	Aprilani Soegiarto
	A. B. Abol-Munafi
Dr.	Wendy Kenyon
	Susie Westmacott
	Hin Fui Lim
Ms	Heidi Schuttenberg
	Ian H. Langford
	Ilias Zaidnuddin
	J. D. van der Werff ten Bosch
Dr.	Kasijan Romimohtarto
	Mohd Parid Mamat
	N. A. M. Shazili
Dr.	Muhammad A. Arshad

Experts Who Reviewed the Survey (comments included in revised and final survey version)

Prefix	Name
Dr.	John C. Whitehead
Dr.	Baruch Fischhoff
Dr.	A. Myrick Freeman III
Dr.	H. Jack Ruitenbeek
Dr.	Ian Bateman
Dr.	John B. Loomis
Ms.	Zeinab M. Ngazy
Dr.	Allan Randall
Dr.	Venetia Hargreaves-Allen
Dr.	Paolo Nunes
Dr.	Bob Leeworthy
Dr.	J. Mike Bowker
Dr.	Randall Kramer
Dr.	Steven M. Thur
Dr.	Robert Cameron Mitchell
Mr. ? Dr. ?	Thomas Graham
Dr.	Pieter J. van Beukering

NOTE: for details on their reviews contact Carolyn Fonseca

APPENDIX G: Expert Review Letter

Aug. 24th, 2007

Dr. John C. Whitehead
Department of Economics
Appalachian State University
Boone NC 28608-2051

Dear Dr. John C. Whitehead,

Enclosed you will find the survey for review, as mentioned in the e-mail. Thank you again for reviewing the questionnaire. I have also included a copy of my proposal, should you wish more information.

The research study aims at gathering data on how individuals who live 'far' (Atlanta, GA) and near coral reefs (Fiji) value these ecosystems. I am interested in learning how much households would be willing to donate towards a trust fund run by two non-profit organizations. This is an actual program that will be in place beginning of the late fall of 2007 (although in the survey it is presented as a scenario). Ultimately, I will compare results between my survey (willingness-to-pay for conservation) and actual donation behavior.

Some information about the study:

- I am purchasing my sample of 4,000 household addresses in the Metro Atlanta Area (Georgia, USA), sampled at the block group by income level (three tiers).
- Each address will be sent a package in the mail in early Oct. 2007.
- Each package will contain 1 survey, 1 return envelope, and 1 cover letter.
- This is a 3 wave survey (3 mailings).
- Compensation to participants will be in the form of a lottery drawing for cash prizes. Those who participate, when they return their survey to us, their ID will be entered to win a prize.

Because I would really like to include your comments and feedback, it would be great if you could send your response by **Sept. 24th 2007**.

I look forward to hearing your suggestions and comments. I am very grateful for your time and appreciate your help. Please feel free to contact me should you have questions.

Sincerely,

Carolyn Fonseca
PhD Candidate Environmental Policy
carolyn.fonseca@gatech.edu
Environmental Policy
685 Cherry Street
School of Public Policy
Georgia Tech
Atlanta, GA

PS- Also, feel free to pass the survey along to other colleagues whom you feel could provide interesting feedback.

APPENDIX H: Survey Expert Version

Thank you for your time and participation!

Please use the space below to share with us any other comments or thoughts.

As a way to thank our participants, we will be awarding 5 cash prizes. There will be a lottery drawing in which all participants will have an equal chance of winning one of the 5 prizes. Good Luck! Should you be a winner, you will receive you prize in the mail. We will not share your information with any third parties.

Funding Provided by:
The Community Foundation
For Greater Atlanta Inc.

Survey ID _____

Environmental Survey 2007

A study by the:

Georgia Institute of Technology

We are grateful for your help in completing our survey. Information you provide is completely confidential. This is not a solicitation, nor will any information be shared with a third party. The purpose of this survey is to learn about how Atlantans view environmental issues. We value your opinion. Thank you for your participation.

Contacts:
Dr. Doug Noonan or Carolyn Fonseca
"ourwebpage.gatech.edu"
(404) NEW-PHONE
685 Cherry Street, DM Smith Bldg.
School of Public Policy
Atlanta, GA 30332-0345

Instructions: please read each question carefully and state your answer as truthfully as possible. Your opinions are valuable to us. By providing us with genuine information we can produce data reflective of your true values and beliefs. There are no wrong answers.

START here: SECTION I : experiences, activities, and knowledge.

Q-1 Have you seen any of the following movies?

	Yes	No		Yes	No
Jaws	☐	☐	March of the Penguins	☐	☐
Finding Nemo	☐	☐	Happy Feet	☐	☐
The Lion King	☐	☐	Jurassic Park	☐	☐

Q-2 Have you seen any of the following TV shows?

	Yes	No		Yes	No
Nova (PBS)	☐	☐	Live Earth Concert 2007	☐	☐
Survivor	☐	☐	Shark Week	☐	☐
Planet Earth	☐	☐	Meerkat Manor	☐	☐

Q-3a Do you currently own a pet?

☐ Yes ☐ No (GO to Q-4)

Q-3b If you answered "Yes" to Q-2, what kind of pet(s)?
(mark an X in all that apply)

☐ Cat ☐ Dog ☐ Bird ☐ Fish ☐ Other

Q-4 Have you been to a neighborhood park in the last 7 days?

☐ Yes ☐ No

Q-5 Please state if you recycled any of the following in 2006:
(circle yes or no)

Paper	Yes	No
Plastic	Yes	No
Cans	Yes	No
Glass	Yes	No
Computer Parts (printer cartridges, etc.)	Yes	No
Batteries	Yes	No
Appliances	Yes	No

FINAL QUESTIONS

Q-26 What is your highest level of education?

- ☐ High School Degree
- ☐ Some College
- ☐ College Degree
- ☐ Graduate/Professional Degree
- ☐ Other

Q-27 What is your current primary occupation?

_____ primary occupation

Q-28 Please mark which category best describes your total household income for 2006: (mark ONLY one)

- ☐ Under $5,000
- ☐ $5,000 to less than $10,000
- ☐ $10,000 to less than $15,000
- ☐ $15,000 to less than $20,000
- ☐ $20,000 to less than $25,000
- ☐ $25,000 to less than $30,000
- ☐ $30,000 to less than $35,000
- ☐ $40,000 to less than $45,000
- ☐ $45,000 to less than $50,000
- ☐ $50,000 to less than $100,000
- ☐ $100,000 and over
- ☐ Did not receive any type of income for 2006
- ☐ Don't know

Q-29 Are there currently any children living in your home?

☐ Yes ☐ No

Q-30 What is your current marital status?

- ☐ Single
- ☐ Married/Life Partner
- ☐ Divorced or Separated
- ☐ Widowed

Q-31 What is your gender?

☐ Male ☐ Female

Q-32 What is your age? _____ years

Q-33 Can you share with us your racial/ethnic group?

- ☐ African America/Black
- ☐ Asian
- ☐ Caucasian/White
- ☐ Hispanic/Latino
- ☐ Native American

SECTION III: questions about your interests and affiliations.

Q-18a Have you ever given a monetary donation to a non-profit organization/group/charity/project?

☐ Yes ☐ No (GO to Q-20)

Q-18b If YES to Q-12, to what type of charity/organization/project? (mark all that apply)

- ☐ Sports
- ☐ Education
- ☐ Environment
- ☐ Children
- ☐ Health
- ☐ Disaster Relief
- ☐ Community
- ☐ Other

Q-19 Have you donated time towards an environmental cause, where *environmental cause* could be clean-up your community park, fundraising for an green non-profit, or other similar causes?

☐ Yes ☐ No

Q-20 Do you currently belong to an environmental organization (defined as a group which meets regularly, has an objective and does environmental activities)?

☐ Yes ☐ No

Q-21 What is your current political affiliation?

- ☐ Republican
- ☐ Democrat
- ☐ Independent
- ☐ Other (Reform Party, Libertarian, Socialist, etc.)
- ☐ None
- ☐ Do Not Know

Q-22 Do you attend religious services at least once a week?

☐ Yes ☐ No

Q-23 Have you ever traveled outside the US?

☐ Yes ☐ No

Q-24 How many cars to do you own?

☐ 0 cars ☐ 1 car ☐ >1 cars

Q-25 How long have you lived in your current home? _____years

Q-6 Have you ever visited an aquarium?

☐ Yes ☐ No

Q-7 Please indicate if you have ever done any of the following activities: (mark all that apply)

- ☐ Swimming in the ocean
- ☐ Sea fishing
- ☐ Snorkeling
- ☐ Diving
- ☐ Visited coral reefs
- ☐ Riding in a boat in ocean waters
- ☐ Ecotourism (of any kind)
- ☐ Volunteered for an environmental organization
- ☐ Participated in an environmental event

Q-8 Are you certified for ocean diving (such as PADI, NAUI or other)?

☐ Yes ☐ No

Q-9 Please indicate whether you have attended any of the following during the time frame of *Jan. 2006 to Dec. 2006:*

	(circle yes or no)	
Museum	yes	no
Planetarium	yes	no
Botanical Garden	yes	no
Performance art event	yes	no
Library	yes	no
Sports event	yes	no
Lecture/Educational event	yes	no
Movies	yes	no

Q-10 A coral is a(n) "_____" . (check box that fills in the blank)

☐ Animal ☐ Plant ☐ Mineral ☐ Do not Know

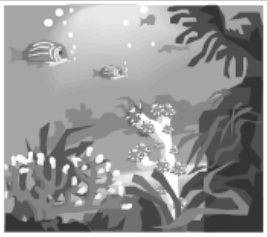
Q-11 The following are some causes of coral reef degradation. In your opinion, which of the following causes the most damage to coral reefs? (mark ONLY one)

- ☐ Global warming
- ☐ High global demand of fish
- ☐ International policies are inadequate
- ☐ Large fleet fishing
- ☐ Local community practices
- ☐ Local government policies are inadequate
- ☐ Hurricanes/Tsunami
- ☐ Natural resource extraction
- ☐ Agriculture
- ☐ Pollution
- ☐ Tourism/Recreation
- ☐ Other

SECTION II : The following describes a hypothetical conservation scenario. After reading the background and program description, please answer Q12-Q17. *This is not a solicitation of any kind.*

CORAL REEFS

Coral reefs provide a variety of benefits like habitat for marine animals, support the local economy, and provide compounds for new drugs to fight human diseases. Coral reefs are highly diverse ecosystems formed by coral communities. Reefs have many fish doing many different jobs. The larger fish keep the reef clean and healthy. As larger fish are removed from coral reefs these are more vulnerable to natural and human type of stresses.



- Large-scale open ocean fishing has put more pressure on the coral reefs.
- A decrease in large open ocean fish has forced local fishermen to increase fishing in nearby reefs.
- As the larger fish disappear, so do the coral reefs' defenses. This means coral reefs cannot defend themselves against increased pollution (logging and agriculture) or natural events (hurricanes).
- For example, in Fiji 68% of coral reefs are under severe threat primarily from decline in larger reef fish and pollution.

FIJI

Fiji is a country located in the South Pacific with the size of New Jersey comprised of more than 332 Islands. In Fiji, the land and coral reefs are managed and owned by the local communities. Currently, local fishermen are unable to compete with large scale fishing and have begun to fish from the reefs. A consequence of local reef fishing has been deterioration in the health of the corals. An innovative policy has been proposed to address the Fijian coral reef decline. This conservation program would be called "Adopt-a-Coral".

"ADOPT-a-CORAL" CONSERVATION PROGRAM

- **Two non-profit organizations have created a trust fund through a program called "Adopt-a-Coral". Money from this fund will help monitor the health of the reefs, re-establish corals, and set aside no-fishing areas.**
- **One non-profit is run by locals, responsible for implementing the program, and receives 80% of the funds.**
- **The other non-profit is international and is responsible for collecting the funds. The international non-profit gets the remaining 20% of funds from the trust.**
- **Both organizations have proven themselves in the past to work well together, efficiently and produce results.**

Keeping in mind your income, please answer the following questions:

Q-12 Would you donate any money to the "Adopt-a-Coral" program in Fiji, which ensures the improvement of larger fish in the reef, helps the local economy, and protects coral reef health?

☐ Yes ☐ No (GO to Q-16)

Q-13 If Yes to Q-14, how much would you be willing to donate to the "Adopt-a-Coral" program (ONE TIME DONATION)?
(mark the HIGHEST amount)

☐ $0.50 ☐ $1.00 ☐ $5.00 ☐ $10.00
☐ $15.00 ☐ $30.00 ☐ $50.00 ☐ Other ____

Q-14 How sure are you that you would actually donate the amount in Q-14?

☐ Very sure ☐ Sure ☐ Not Sure at All

Q-15 What is the primary motivation behind your donation?
(mark ONLY one)

☐ helping a local community ☐ helping the environment
☐ "giving makes me feel good" ☐ for future generations

Q-16 SKIP if you answered Yes to Q-12. If you stated No in question Q-13, would you change your mind and donate money, if you the program was in the USA?

☐ Yes, I would change my answer and donate money
☐ No, I would not change my answer to Q-13

Q-17 The communities in Fiji are losing the quality and quantity of their coral reefs. Who will have the most to lose by the decline of Fijian coral reefs?
(mark only one)

☐ Global economy
☐ Fijian coral reefs
☐ Community fishermen
☐ The Georgia Aquarium
☐ Human society
☐ Fijian tourism/recreation
☐ The Fijian reef's biodiversity
☐ Atlanta households
☐ Other
☐ Do Not Know

APPENDIX I: Codebook

Survey Coral Reef 2007 Codebook

- When 2 answers are marked a coin is tossed and one answered is selected
- 9 usually means left blank the person did not answer (there are exceptions)
- 8 usually means skipped, as in a 2 part question
- Each question in this codebook will have a "____" next to it indicating the number of answers to be coded for that question
- PROBLEM: q5, q6, if no box was checked it could mean two things, 1-the person did not do any of those activities hence they left them blank, or 2-the person skipped the question. Because we do not know which answer is the right one, if the person left them all blank, we assume they skipped (although is potentially is incorrect), and code all 9's; if the person checked at least one box, then we assume 2's for the rest, meaning they did not do that activity. This problem arose because of the how the question was structured in the survey by the researchers and should be changed next time

Q-1 Have you seen any of the following movies?

1= Yes
2= No
9= Missing Data (left blank did not respond)

____ Q-1a Jaws

____ Q-1b Finding Nemo

____ Q-1c The Lion King

____ Q-1d March of the Penguins

____ Q-1e Happy Feet

____ Q-1f Jurassic Park

Q-2 Have you seen any of the following TV shows?

1= Yes
2= No
9= Missing Data (left blank did not respond)

____ Q-2a Nova (PBS)

____ Q-2b Survivor (CBS)

____ Q-2c Planet Earth

____ Q-2d Live Earth Concert 2007

____ Q-2e Shark Week

____ Q-2f Meerkat Manor

____ Q-3a Do you currently own a pet?

1= Yes
2= No
9= Missing Data (left blank did not respond)

Q-3b If you answered "Yes" to Q-3a, what kind of pet(s)

1= checked box
2= left blank and assumed they do not have that type of pet (if checked at least one box)
9= Missing Data (left blank did not respond)
8= Skip (answered "No" to Q-3a)

____ Q-3a_Dog

____ Q-3b_Cat

____ Q-3c_Fish

____ Q-3d_Bird

____ Q-3e_Other

____ Q-4 Last weekend, how much time (non-work related) did you spend doing outdoor exercise (i.e. walking, jogging, hiking, etc.)?

Numeric 00.0 (three digits)
When presented with answers such as "more than 3 years" add a 0.5 to the number, "3.5"
When writing "6-8hrs" pick middle of number (ie:"7")

Q-5 In 2007, have you recycled any of the following?

1= checked box
2= left blank and assumed they did not recycle that material (checked at least one box)
9= Missing Data (left blank did not respond)

____ Q-5a Appliances

____ Q-5b Batteries

____ Q-5c Cans

____ Q-5d Computer Parts

____ Q-5e Glass

____ Q-5f Paper

____ Q-5g Plastic

Q-6 Have you participated in any of the following activities?

1= checked box
2= left blank and assumed they did not do that activity (checked at least one box)
9= Missing Data (left blank did not respond)

____ Q-6a Swimming in the ocean

____ Q-6b Sea fishing

____ Q-6c Snorkeling

____ Q-6d Scuba Diving

____ Q-6e Boating in the ocean

____ Q-6f Ecotourism

____ Q-6g Visited coral reefs in their natural habitat

____ Q-6h None of the above

____ Q-7 Are you certified for scuba diving? (such as PADI, NAUI, or other)?

1= Yes
2= No
9= Missing Data (left blank did not respond)

Q-8 Have you attended or visited any of the following during 2007:

1= Yes
2= No
9= Missing Data (left blank did not respond)

____ Q-8a Aquarium

____ Q-8b Botanical Garden

____ Q-8c Lecture/Education Event

____ Q-8d Movie

____ Q-8e Museum

____ Q-8f Performance Art Event

____ Q-8g Planetarium

____ Q-8h Public Library

____ Q-8i Sports Event

Q-9 What is a coral?

____ 1= Animal

____ 2= Mineral

____ 3= Plant

____ 4= Do not know

____ 5= Animal and Plant boxes both checked

____ 9= Missing Data (left blank did not respond)

Q-10 Before today, what have you read/heard about the following coral reef problems in terms of causing damage to the coral reefs?

1= no damage
2= slight damage
3= some damage
4= most damage
5= Do not know
9= Missing Data (left blank did not respond)

____ Q-10a High demand for fish
____ Q-10b Hurricanes/Tsunamis
____ Q-10c International Policies
____ Q-10d Large fleet fishing
____ Q-10e Local fishing
____ Q-10f Local government policies
____ Q-10g Logging/Agriculture
____ Q-10h Tourism/Recreation
____ Q-10i Other _____ (write in survey other codes as other categories as given)

- Code as 10 or 8 as skip meaning they did not have another category (only if at least one answers was provided for any of the above)
- 10j global warming
- 10k oil spills and ships
- 10l gemstones
- 10m carelessness
- 10n anchors temperature and pollution
- 10p boating
- 10q disease
- 10r pollution
- 10s pollution/coral bleaching
- 10t ocean warming

- 10u chemicals
- 10v natural coral predators
- NEW Categories, add on "10__", these will all be recoded at a later date
- If none of the questions were answered then this is coded 9 as missing data

____ Q-11 Would you give a one-time donation to the "Adopt-a-Coral" program in Fiji to restore 10 (4) miles of reef?

1= Yes
2= No, not affordable/interested (code Q-12 as 000.00, Q13-14 code 8 and 8)
3= No, other (code Q-12 as 000.00, Q13-14 code 8 and 8)
9= Missing Data (left blank did not respond)

____ Q-12 Mark the maximum amount below:

Numeric 000.00 (five digits)
If Q-11 is coded as 2 or 3, then code as 000.00

999.99 = Missing Data (left blank did not respond)
NOTE: some of these got coded as "q" meaning missing data, its actually 9

____ Q-13 How sure are you that you would actually donate the amount in Q-12?

1= Not sure
2= Somewhat sure
3= Sure
4= Very sure
8= Skip (stated No in Q-11)
9= Missing Data (left blank did not respond)

____ Q-14 What is the primary motivation behind your donation?

1= for future generations
2= helping a local community
3= giving for personal satisfaction
4= helping the environment
5= to get a tax deduction
6= other _____ (write in survey other codes as other categories as given)
*** Note if "other" was selected and there is text, just make a note somewhere (on a separate sheet), for example ID 689A wrote in "Diver"
8= Skip (stated No in Q-11)
9= Missing Data (left blank did not respond)
NOTE Survey 535a3 answered "for the prize money"

____ Q-15 Would you give a one-time donation to the "Adopt-a-Coral" program if it was in the United States (e.g. Hawaii, Florida Keys)?

1= Yes
2= No, not affordable/interested
3= No, other
9= Missing Data (left blank did not respond)

____ Q-16 In your opinion, what will be hurt the most by the possible decline of Fijian coral reefs?

1= Atlanta households
2= Biodiversity

3= Fijian coral reefs

4= Fijian fishermen

5= Fijian tourism/recreation

6= Fishing industry

7= Global economy

8= Humankind

***** NO 9, 9=missing

10= Oceans

11= The Georgia Aquarium

12= Other

13= Do not know

9= Missing Data (left blank did not respond)

____ Q-17a For the year 2007, have you given a monetary donation to a non-profit organization (non-government or charitable group)?

1= Yes
2= No
9= Missing Data (left blank did not respond)

Q-17b If Yes to Q-17a, to what type of non-profit organization

1= Yes
2= No

8= Skip (answered No in Q-17a)
9= Missing Data (left blank did not respond to any)

____ Q-17a_Children

____ Q-17b_Community

____ Q-17c_Education

____ Q-17d_Environment

____ Q-17e_Health

____ Q-17f_Religous

____ Q-17g_Political

____ Q-17h_Disaster Relief

____ Q-17b_Other (habitat for humanity/heifer international)

____ Q-18 In 2007, have you donated time towards an environmental cause, where environmental cause cold be clean-up community park, fund raise for a green non-profit, or other similar causes?

1= Yes
2= No
9= Missing Data (left blank did not respond)

____ Q-19 Do you currently belong to an environmental organization (as a paying/non-paying member, participant and/or officer)?

1= Yes
2= No
9= Missing Data (left blank did not respond)

____ Q-20 For 2007, which category best describes your political views?

1= Conservative

2= Liberal

3= Independent

4= Other (Reform Party, Libertarian, Socialist, etc.)

5= Mixed

6= None

7= Do not know

8= Do not wish to answer

9= Missing Data (left blank did not respond)

____ Q-21 On average for 2007, how often would you say you attend religious services?

1= never

2= weekly

3= monthly

4= yearly

NOTE---if “daily” put in weekly

NOTE---future question add “at least” or daily or other

____ Q-22 Have you ever traveled outside the US?

1= Yes
2= No
9= Missing Data (left blank did not respond)

____ Q-23 Mark the total number of cars currently in your household:

1= 1 car
2= 2 cars
3= 3 or more cars
4= None
9= Missing Data (left blank did not respond)

____ Q-24 How long have you lived in your home?

00.0 Three digits for year
If person answered “more than 3 years”, then add 0.5, “3.5”
If un-even digit like “0.47” then round up “0.50”

____ Q-25 What is your gender?

1= Male
2= Female
9= Missing Data (left blank did not respond)

____ Q-26 What is your age?

00.0 Three digits for year

____ Q-27 What is your highest level of education?

1= Some high school or less
2= High School degree
3= Some college
4= College degree
5= Graduate/professional degree/Post Graduate
6= Other
9= Missing Data (left blank did not respond)

____ Q-28 How many children (<18 years) are currently living in your house?

00 Two digits of total number of kids

____ Q-29 Please mark the category that best describes your estimated total 2007 household income:

1= Under $25,000
2= $25,000 to less than $35,000

3= $35,000 to less than $45,000

4= $45,000 to less than $55,000

5= $55,000 to less than $65,000

6= $65,000 to less than $75,000
7= $75,000 to less than $85,000

8= $85,000 to less than $95,000

***** NO 9, 9=missing data

10= $95,000 to less than $125,000

11= $125,000 to less than $150,000
12= $150,000 to less than $200,000
13= $200,000 to less than $300,000
14= $300,000 to less than $400,000
15= $400,000 or greater

16= Do not know
17=Do not wish to answer
9= Missing Data (left blank did not respond)

NOTE: some of these got coded as “q” meaning missing data, its actually 9

____ Q-30 What is your primary occupation?

**** SEE CODES at the end of this codebook

____ Q-31 What is your current marital status?

1= Never married
2= Married/life partner

3= Divorced or separated

4= Widowed

9= Missing Data (left blank did not respond)

____ Q-32 Would you share with us your race?

1= African American/Black
2= Asian

3= Caucasian/White

4= Hispanic/Latino

5= Native American

6= Other

**** if “Other” was selected and they wrote something, just write it down somewhere on a sheet, including the ID of the survey

7= Mixed

9= Missing Data (left blank did not respond)

____ Q-33 Comments Yes/No

1= Yes
2= No

____ Q-34 Comments

Write in comments text

____ Q-35 Coder ID

1= Carolyn

2= _____

3= Terry

RC__ ReCoder ID

1= Carolyn

2= _____

3= Terry

Survey ID_A or ID_B

Numeric

Occupations Codes for Q-30

CODES	Occupation
999	Missing Data
100	Housewife/Homemaker/Mother
200	Retired
300	Unemployed
400	Office Manager
401	Registered Nurse/Registered School Nurse/Nurse
402	Swim Coach
403	Truck Driver
404	Investment Banker/Banking
405	Network Trouble shooter/Network Manger Telecommunications
406	Real Estate Realtor/Commercial Real Estate/Developer/Sales Agent
407	Student
408	Teacher/Education Teacher/Teaching
409	Writer/Editor
410	Administrative Assistant
411	Speech Language Pathologist
412	Accountant/CPA/CPA Controller/Staff Accountant
413	Psycho Therapist/Psychologists
414	Computer Engineer
415	Contractor
416	Physical Therapist
417	CEO/Vice President

418	Management/Manager/Project Manager/Coordinator
419	Systems Specialist (Information Systems)
420	Customer Service
421	Clerical
422	Telemarketer
423	Dental Assistant
424	Education
425	College Teacher
426	Consultant
427	Loan Officer
428	Training Consultant
429	Biology Lecturer
430	Claims Examiner/Claims Processor
431	Prop Maker
432	Attorney
433	Remodeling Contractor
434	Truck Inspector
435	Human Resources
436	Service Technician
437	School Bus Driver
438	Drill Operator
439	RT (Respiratory Therapist)
440	Collector
441	Graphic Designer
442	Public Service

443	Construction Project Manager
444	Store Manager
445	Auditor
446	University Professor
447	Veteran's Claims Examiner
448	Business Analyst
449	Artist/Musian
450	Civil Engineer
451	Engineer
452	School Psychologist
453	Transportation Security Officer
454	Federal Auditor
455	County Extension Agent
456	Executive Director/Environmental Non-Profit
457	Sand and Topsoil
458	Volunteer
459	Social Work
460	Floral Designer
461	Farming
462	None
463	Flight Attendant
464	Greenhouse-Retail Nursery
465	"Jack-of-all-trades"
466	Pathologist
467	Gardener

468	Lab Tech Microbiology
469	Grounds Maintenance/Horticulturist
470	Program Manager
471	Office –Clerical-Administrative Assistant
472	Avionics Technician
473	Radio Advertising
474	Tax Preparer
475	Chemist/Taxi Driver
476	Educator
477	Marketing
478	Stock Person
479	Paralegal
480	Tennis Instructor
481	General Contractor
482	Retail Management
483	Statistician
484	Engineering Specialist
485	Executive
486	Business Owner
487	Dispatcher
488	Healthcare Provider
489	AT&T Manager
490	Admin
491	Part-time Sales/ Sales
492	Custodian

493	Self-Employed-Own tea Company
494	MD
495	Minister-Chaplain/Sunday School
496	
497	

*** NOTE Add codes as needed

APPENDIX J: Correlation Matrix for Variables (coefficients and p-values for each variable).

	DV	Cultural Experience	Movie Experience	Ocean Experience	Recycling Behavior	Travel Outside the US	Previous Donor	Number of Household Children	White	Male	Income
DV	1										
Cultural Experience	0.1203	1									
	0.0674										
Movie Experience	0.0208	0.3210	1								
	0.7522	0.0000									
Ocean Experience	0.2819	0.2209	0.0508	1							
	0.0000	0.0005	0.4266								
Recycling Behavior	0.1752	0.1867	0.0788	0.1976	1						
	0.0075	0.0032	0.2169	0.0018							
Travel Outside the US	0.0456	0.0569	-0.0129	0.1803	0.1833	1					
	0.4926	0.3804	0.8424	0.0051	0.0044						
Previous Donor	0.1859	0.0815	0.0799	0.0992	0.1146	0.1368	1				
	0.0049	0.2104	0.2194	0.1269	0.0776	0.0349					
Household Children	-0.0425	0.1241	0.1558	-0.0004	0.0614	0.0105	0.1109	1			
	0.5259	0.0569	0.0166	0.9946	0.3478	0.8725	0.0904				
White	0.0875	0.0782	-0.1059	0.3711	0.3391	0.1497	0.0945	-0.1459	1		
	0.1920	0.2324	0.1053	0.0000	0.0000	0.0217	0.1503	0.0257			
Male	-0.0826	0.0493	0.0217	0.1638	0.0257	-0.0140	-0.0547	0.0526	0.0192	1	
	0.2153	0.4487	0.7396	0.0114	0.6933	0.8296	0.4031	0.4210	0.7701		
Income	0.1455	0.0968	0.0492	0.2265	0.1686	0.1283	0.1602	0.1143	0.3103	0.2193	1
	0.0414	0.1664	0.4828	0.0011	0.0154	0.0662	0.0221	0.1035	0.0000	0.0015	

APPENDIX K: Mlogit and RRR (Relative Risk Ratios)

Multinomial Logistic Regression DV = "mlog_3donor" (Local/Global, Giver, NonGiver)		LOCAL/GLOBAL (joined)			GLOBAL dropped (n=3)		
		Sig.	**RRR**	**Coeff.**	**Sig.**	**RRR**	**Coeff.**
The Local/Global Giver	Cultural Experience		1.031	0.031		1.018	0.018
	Movies Experience		0.914	-0.090		0.916	-0.088
	Ocean Experience		1.324	0.280	**	1.458	0.377
	Recycling Behavior	**	1.431	0.359	*	1.406	0.341
	Travel Outside US		1.387	0.327	***	########	18.587
	Previous Mon. Donation		1.279	0.246		0.893	-0.114
	Household Children		0.938	-0.064		0.997	-0.003
	White		2.552	0.937		1.830	0.604
	Male	**	0.258	-1.356	**	0.285	-1.256
	Income ($10,000)		1.007	0.007	*	1.008	0.008
	Constant			-5.052			-23.151
The Giver	Cultural Experience		1.042	0.041		1.040	0.039
	Movies Experience		0.986	-0.014		0.984	-0.016
	Ocean Experience	***	1.562	0.446	***	1.568	0.450
	Recycling Behavior	**	1.256	0.228	**	1.251	0.224
	Travel Outside US		0.802	-0.220	*	0.817	-0.202
	Previous Mon. Donation	*	4.833	1.575		4.756	1.559
	Household Children		0.871	-0.138		0.876	-0.132
	White		0.485	-0.723		0.480	-0.733
	Male	**	0.390	-0.941	**	0.398	-0.922
	Income ($10,000)		1.005	0.005		1.005	0.005
	Constant			-2.988			-2.985
	Number of obs		193			191	
	LR chi2(20)		52.05			53.57	
	Prob > chi2		0.0001			0.0001	
	Pseudo R2		0.1425			0.1506	
	Log likelihood		-156.62			-151.12	

APPENDIX L: Survey Mailing Process

The following is an outline of the process for printing and mailing of the surveys to the 2000 Atlanta households:

Georgia Institute of Technology PCS (N=2000 individual household addresses, 1 split)

Order 1 (Mailing Wave 1):

- 3000 Survey A (ID repeated 3 times for 1000 households)
- 3000 Survey B (ID repeated3 times for 1000 households)
- 4800 Reply Envelopes
- 2000 Letter on Letterhead IAC (printed not personalized but different for each wave)
- 2000 outgoing envelopes
- Postage outgoing for 2000
- Seal sort deliver for 2000

Mail Assembly:

1. PCS prints survey with ID, letter, outgoing envelope
2. Carolyn and Team fold and hand-sign 2000 cover letters and deliver to PCS
3. PCS inserts matching outgoing address/ID with survey ID (1000 from Survey A and 1000 from Survey B), add letter, add folded return envelope
4. PCS seals, sorts and delivers to post office (Nov. 2007)
5. PCS is charged with postage

Order 2 (Mailing Wave 2):

- 1600 Letter on Letterhead IAC (printed not personalized but different for each wave)
- 1600 outgoing envelopes
- Postage outgoing 1600
- Seal sort deliver 1600

Mail Assembly:

1. Carolyn and Team fold and hand-sign 1600 cover letters and deliver to PCS

2. PCS inserts matching outgoing address/ID with survey ID (800 for Survey A and 800 from Survey B), add letter, add folded return envelope
3. PCS seals, sorts and delivers to post office (Dec. 2007)
4. PCS is charged with postage

Order 3:

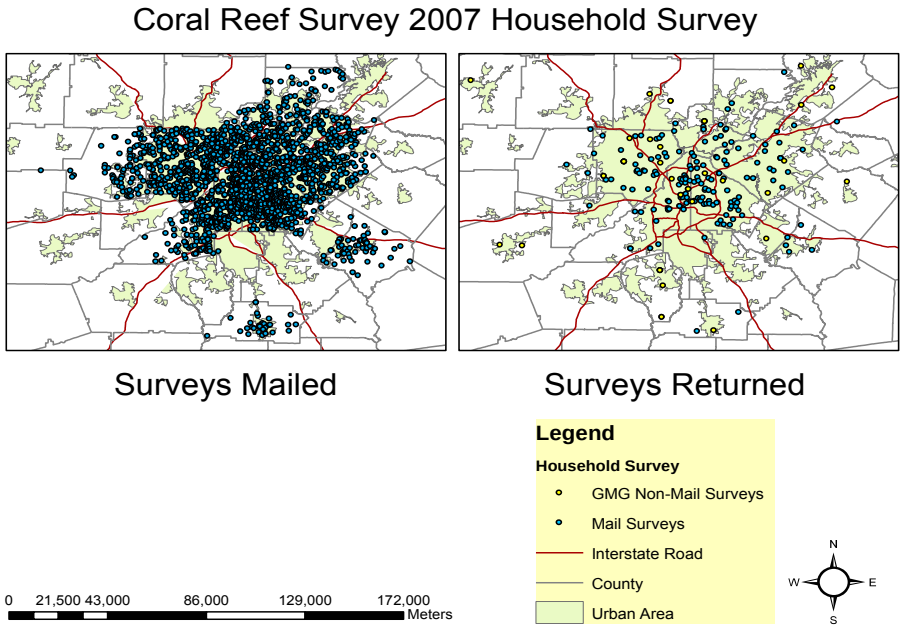
- 1200 Letter on Letterhead IAC (printed not personalized but different for each wave)
- 1200 outgoing envelopes
- Seal sort deliver 1200
- Postage outgoing 1200

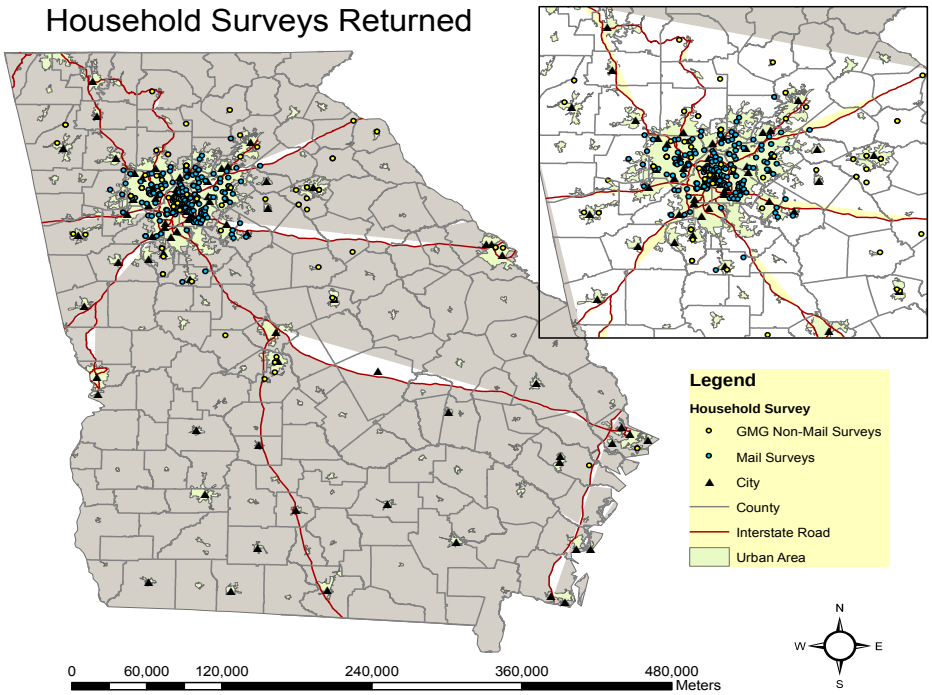
Mail Assembly:

1. Carolyn and Team fold and hand-sign 1200 cover letters and deliver to PCS
2. PCS inserts matching outgoing address/ID with survey ID (600 for Survey A and 600 from Survey B), add letter, add folded return envelope
3. PCS seals, sorts and delivers to post office (Jan. 2007)
4. PCS is charged with postage

APPENDIX M: Maps of Survey Participants

Map of the location of households from the mail sample "Surveys Mailed" compared to the map with locations of surveys returned for both samples (mail and non-mail), "Surveys Returned" map.





Georgia map of survey respondents for both samples.

APPENDIX N: Focus Groups

Focus Group	Size/Composition	Problems	Group Comments
Young Scholars Griffin GA	19 (minorities, men and women)	The group was large and with young student difficult to keep everyone on track; there was a tendency for them to all speak at once (having a second mediator would have helped)	• Problems understanding the word environment
North Fulton Master Gardeners	10 (older retired group men and women)	This group is highly wealthy retired group mostly White, educated and retired	• Q19 (scale)-they did not like the wording in the quotes • Would not give money-already giving money to other causes • Would not give donation here, but would give money when on location to the donation box • They would give money because of a connection to the issue (or network-because of a person) • Add more information about why a survey, rationale behind having the person fill out the questionnaire • Other causes of damage to coral reefs, recreation and tourism • Add something on the letter about recycling paper • We should not be giving money for Fiji conservation, the Georgia Aquarium should be the one working on this issue • Survey was easy, it was short • Do not want to share income • Worried it sounded like a solicitation and thus would not answer the survey • Boxes for answers too small • Add details about the overhead of the nonprofit • The survey scenario read like it was soliciting money-they did not like that • Would not fill out the survey because it would lead to being on solicitation lists • Not interested in coral reefs
Griffin	6	They were more	• Survey was short

Public Library Book Club	(diverse men and women middle class and low income group)	quiet than the previous group and had a harder time understanding the objective of the focus group but they were very willing to help	• They would have liked color pictures • Would not donate to the reef project because donating to other causes already

Georgia Institute of Technology Group 1	7 (PhD students, staff and faculty)	Highly experience group with survey methods	• Picture-
			  ○ seemed too immature and caricature like
			  ○ might alienate other groups, like farmers or fishermen since they are not in the picture
			  ○ one person liked picture, add sun to make it happier
			  ○ maybe use a picture of a coral and ocean or underwater
			• Overall look was NOT professional
			• Too crowded
			• Move the funding information lower
			• Contact info-maybe place in the cover letter
			• Recycle paper-maybe use recycled paper since its environmental
			• Make the GT logo bigger
			• Maybe not use the graduate student sympathy, instead make it look more like a GT project, keep Noonan name
			• Make explicit what the survey is for, what you want from the participant and that it is not solicitation
			• Maybe call if Survey Reef Survey
			• Move the title from the side to the front cover, for a more professional read
			• Maybe remove contact info from survey add to cover letter
			• Phone number-get one with an answering machine for contact information
			• Webpage with all the information giving the project legitimacy
			• Get an address PO box for the returns
			• Poor quality paper, not professional enough
			• Q1-5 gave the wrong impression and set the wrong overall feel
			• Q5 add conservative groups as the question is now it has a very one sided political feel
			• Q3 add fish to see who has aquarium
			• Organize and change the order of the questions, group them more by type of questions
			• Misspelling in Williey and Nemo, add the correct names of the movies

			• Start survey with Q9 • People tend to be sensitive about Q5 • Income question- maybe consider asking something like "what is your monthly expendable income?" instead of income • Q19 –paradigm, maybe use a question like "economic growth versus environmental protection" which end of the spectrum • Shorten scenario • No one will read it • Wording like "runoff" too technical • Simplify and dumb down • Separate coral reefs from Fiji, why Fiji, and does it only have to be about Fiji coral reefs • Start with coral reefs, and then maybe a question about coral reefs in certain areas • Maybe present a variety of scenarios from which to choose and let them select one • RISK, will affect validity how to address it • Consider adding a political gradient to some extent reflecting their donation behavior • Adding some new questions • START order with Q9 and 8 and 1, 2, 3 and 22 21 etc • What kind of shows and channels do people watch • How much did you give in monetary contributions for the year 2006 • Where any of the donations towards an environmental issue? • Would you donate towards the conservation of coral reefs? • If yes how much?' • If yes, where would you donate money towards? (Fiji, Caribbean) • How much would the level of risk (in terms of severity of degradation) impact your donation? • How might risk affect the amount you donate • Define some terms, people might not know • Order of questions • Remove the "Survey ID" to the back of the survey • Add "a recycle paper note" since using the paper from the printing company, the paper selected is 30% post consumer recycled
Georgia Institute of Technology Group 2	5 (PhD students)	They took the survey and gave written comments	• Short and easy to take • Suggest using color for the pictures
Georgia Institute of	5 (PhD students	The group itself was highly elite in terms	• Survey clear • Liked the picture

Technology Group 3	and faculty)	of survey and research experience	• Suggested to add my name and Dr. Noonan's
			• Move title to center and lower, remove draft
			• Overall impression liked the look of the survey
			• Order of questions so that they are grouped
			• Suggested to add titles to the sections
			• Q-2 and Q-3 make arrow and below the question
			• Section III scenario
			  o Explain why fiji is selected
			  o Consider using "developing country and not a particular name"
			• Q-14 is the person donating 1 time or annually?
			• Typos and misspellings, also editing of text
			• Q-18 add human component category
			• Q-26 Q27 also nested question with tab
			• Back of the survey add space for comments
			• Q-5 problematic too long
			• Scenario order of information not an issue
			• Q-12 wrong order of categories
			• Add Natural Resource extraction

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VITA

Carolyn E. Fonseca

FONSECA began her academic studies in 1991 obtaining an A.A. degree from Emory University Oxford College and a B.S. in Zoology from the University of Georgia. She went to further her education in Pennsylvania earning a M.S. in Biology from West Chester University. Her research focused on modeling dolphin swimming behavior. Two years later, she went on to begin her environmental policy studies at the Georgia Institute of Technology graduating first with a M.S. in Public Policy and most recently a doctorate in Environmental Policy. Carolyn was born in New York and raised in Tegucigalpa, Honduras. She is the daughter of Marco Fonseca who was born in Honduras and Terry Fonseca a US citizen. She is the oldest of three with a sister named Susan and a brother named Michael. Currently, Carolyn is a consultant for an international nonprofit and spends her time with her niece and nephew Isabella and Evan, and her two cats Koko and Linlin. Carolyn has traveled to many places including Brazil, China and Canada. She hopes to one day visit Australia, Scotland and Thailand. Fonseca resides in Atlanta GA.